INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON STANDARDS OF TRAINING AND WATCHKEEPING
43rd session
Agenda item 3

STW 43/3/1
4 May 2011
Original: ENGLISH

VALIDATION OF MODEL TRAINING COURSES

Model course – Operational use of Electronic Chart Display and Information Systems (ECDIS)

Note by the Secretariat

SUMMARY

Executive summary:	This document provides a revised draft model course on the operational use of Electronic Chart Display and Information Systems (ECDIS)
Strategic direction:	5.2
High-level action:	5.2.2
Planned output:	5.2.2.5
Action to be taken:	Paragraph 4
Related document:	STW 40/14

1 The Sub-Committee, at its fortieth session noted that consequent to the adoption of the Manila Amendments to the STCW Convention and Code, the model course related to ECDIS would need to be reviewed and updated. Accordingly, the Sub-Committee instructed the Secretariat to take the necessary steps to revise and update this existing model course and to submit it to the Sub-Committee for validation in due course.

2 The preliminary revised draft of this model course reviewed and updated by Australia and the United States was forwarded to members of the validation panel by the Secretariat for their comments. Relevant comments on the draft course have been received from the validation panel and have been incorporated as appropriate.

3 The final revised draft model course is set out in the annex.

Action requested of the Sub-Committee

4 The Sub-Committee is invited to consider the above information and take action as appropriate.

***

PIRACY IMO ORCHESTRATING THE RESPONSE

Model Course
1.27

Operational use of Electronic Chart Display and Information Systems (ECDIS)

(2010 Edition)

IMO

Acknowledgements

This 2010 Edition of the IMO Model Course on
the operational use of Electronic Chart Display and Information Systems (ECDIS)
was developed by
the United States Merchant Marine Academy,
Kings Point, New York.

IMO wishes to express its sincere appreciation to
the governments of the United States of America and Australia
for their valuable expert assistance and cooperation.

Table of Contents

		Page
Introduction		1
Part A:	Course Framework	3
Part B:	Course Outline and Timetable	9
Part C:	Detailed Teaching Syllabus	12
Part D:	Instructor Manual	21
Part E:	Evaluation and assessment	62
Appendices for the ECDIS instructor		83
Guidance on the implementation of model courses		97

Introduction to model courses

■ Purpose of the model courses

The purpose of the IMO model courses is to assist maritime training institutes and their teaching staff in organizing and introducing new training courses, or in enhancing, updating or supplementing existing training material where the quality and effectiveness of the training courses may thereby be improved.

It is not the intention of the model course program to present instructors with a rigid “teaching package” which they are expected to “follow blindly”. Nor is it the intention to substitute audio-visual or “programmed” material for the instructor’s presence. As in all training endeavors, the knowledge, skills and dedication of the instructor are the key components in the transfer of knowledge and skills to those being trained through IMO model course material.

Because educational systems and the cultural backgrounds of trainees in maritime subjects vary considerably from country to country, the model course material has been designed to identify the basic entry requirements and trainee target group for each course in universally applicable terms, and to specify clearly the technical content and levels of knowledge and skill necessary to meet the intent of IMO conventions and related recommendations.

■ Use of the model course

To use the model course the instructor should review the course plan and detailed syllabus, taking into account the information provided under the entry standards specified in the course framework. The actual level of knowledge and skills and the prior technical education of the trainees should be kept in mind during this review, and any areas within the detailed syllabus which may cause difficulties because of differences between the actual trainee entry level and that assumed by the course designer should be identified. To compensate for such differences, the instructor is expected to delete from the course, or reduce the emphasis on, items dealing with knowledge or skills already attained by the trainees. He should also identify any academic knowledge, skills or technical training which they may not have acquired.

By analyzing the detailed syllabus and the academic knowledge required to allow training in the technical area to proceed, the instructor can design an appropriate pre-entry course or, alternatively, insert the elements of academic knowledge required to support the technical training elements concerned at appropriate points within the technical course.

Adjustment of the course objectives, scope and content may also be necessary if in your maritime industry the trainees completing the course are to undertake duties which differ from the course objectives specified in the model course.

Within the course plan the course designers have indicated their assessment of the time that should be allotted to each learning area. However, it must be appreciated that these allocations are arbitrary and assume that the trainees have fully met all entry requirements of the course. The instructor should therefore review these assessments and may need to re-allocate the time required to achieve each specific learning objective.

■ Lesson Plans

Having adjusted the course content to suit the trainee intake and any revision of the course objectives, the instructor should draw up lesson plans based on the detailed syllabus. The detailed syllabus contains specific references to the textbooks or teaching material proposed for use in the course. Where no adjustment has been found necessary in the learning objectives of the detailed syllabus, the lesson plans may simply consist of the detailed syllabus with keywords or other reminders added to assist the instructor in making his presentation of the material.

■ Presentation

The presentation of concepts and methodologies must be repeated in various ways until the instructor is satisfied that the trainee has attained each specified learning objective. The syllabus is laid out in learning-objective format and each objective specifies *what the trainee must be able to do* as the learning outcome.

■ Implementation

For the course to run smoothly and to be effective, considerable attention must be paid to the availability and use of:

- Properly qualified instructors
- Support staff
- Rooms and other spaces; equipment
- Textbooks, technical papers
- Other reference material

Through preparation is the key to successful implementation of the course. IMO has produced "Guidance on the Implementation of IMO Model Courses," which deals with this aspect in greater detail and is included as an attachment to this course.

Part A: Course Framework

■ Scope

This model course intends to provide the knowledge, skill and understanding of ECDIS and electronic charts to the thorough extent needed to safely navigate vessels whose primary means of navigation is ECDIS. The course emphasizes both the application and learning of ECDIS in a variety of underway contexts. This is achieved through sophisticated navigation simulation that provides each trainee with unrestrained access to ownship operations integrated with a complete type-approved ECDIS with numerous chart formats installed.

The course is designed to meet the STCW requirements in the use of ECDIS, as revised by the 2010 Manila Amendments, specifically as these apply to Tables A-II/1, A-II/2 and A-II/3, and also to revised guidelines pertaining to training and assessment in the operational use of ECDIS in Table B-I (paragraphs 36 through 66), assessment in navigational watchkeeping, and evaluation of competence, both in Table B-II.

■ Objective

Those who successfully complete this course should be able to demonstrate sufficient knowledge, skill and understanding of ECDIS navigation and electronic charts to undertake the duties of a navigational watch officer defined by STCW Code, as amended. This knowledge, skill and understanding should include Column 1 ECDIS competencies of Tables A-II, but is not limited to:

- Knowledge of the capability and limitations of ECDIS operations, and all indicated sub-topics
- Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, and all indicated sub-topics
- Management of operational procedures, system files and data, and all indicated sub-topics

■ Entry Standards

It is assumed that trainees undertaking this course have accomplished some formal instruction in Terrestrial Navigation, have at minimum some familiarization with visual navigation, have accomplished a period of supervised bridge watch-keeping duties, and have prior completion of basic radar/ARPA (MC 1.07). Trainees should also have considerable familiarization with personal computing operating systems, keyboards and mice or trackballs.

■ Course Certificate, diploma or document

Documentary evidence should be issued to those who have successfully completed this course indicating that the holder has completed training in the navigational use and operation of Electronic Chart Display and Information Systems (ECDIS) based on this model course.

■ Course delivery

The outcome of this course may be achieved through various methods, including simulation-based classroom and laboratory training, or in-service training, or combinations of these methods, such that each trainee is provided unshared access to a type-approved ECIS with ENC data for all required hours of practice and assessment in a controlled visual underway navigational environment.

Methods of distance learning or computer-based training may be used to supplement the familiarization stages of this course, but should not be substituted for the underway assessment of proficiency

■ Course intake limitations

The maximum number of trainees should depend on the facilities and equipment available, bearing in mind the scope and objectives of this course. In particular, class size should be limited to 1 trainee per ECDIS workstation. For example, where a classroom training environment has 12 ECDIS workstations, the maximum class size is 12 trainees. Where there is an additional ECDIS-equipped multiple ownship lab, those ECDIS installations should not be used as substitutions for classroom instruction, nor should it be used to augment the number of trainees taken into the course.

The ratio for lecturing in an open classroom setting and for practical exercises in an Integrated Navigation Lab should be limited to 12:1. When a class size exceeds 12 trainees, an assistant instructor is required in both settings, qualified to the satisfaction of the lead instructor.

■ Staff requirements

The following are the minimum qualification for an instructor of an ECDIS course that adheres to the recommendations of this Model Course. The instructor in charge should:

- Hold a Master license (certificate of competency, issued by IMO white list flag state) or license at least one level above trainee(s) enrolled in course
- Have underway experience as navigator with, and maintainer or supervisor of, type approved ECDIS (extent determined by flag state issuing approval of course)
- Have successful completion of Train-The-Trainer course, preferably including the application of simulators in training
- Have successful completion of an approved ECDIS training course

It is also recommended that the instructor in charge of the course should:

- Be especially skilled in the particular ECDIS employed in the training course
- Have knowledge of the requirements of SOLAS Chapters V/2, V/19, and V/27-20, as amended
- Have knowledge of the ECDIS Performance Standards currently in force
- Have knowledge of the STCW requirements and guidance on ECDIS, as amended
- Be familiar with the current ECDIS equipment and installation requirements of the IEC
- Be familiar with the current ENC data transfer standards and presentation libraries of the IHO
- Be familiar with current methods of ENC data procurement, permitting, and updating
- Be familiar with current IMO recommendations on ECDIS software and other issues

■ Teaching Facilities and equipment

ECDIS Classroom (Open Lab) - Lecturing with practical demonstration is conducted in an ECDIS classroom (Open Lab) setting, where each trainee has sole use of a PC workstation with a resident installation of type-approved ECDIS; all workstations should be networked to an Instructor Station running an integrated navigation simulation application that delivers to each workstation high-fidelity ownship conning controls, navigational aids including GPS, track control-capable Autopilot, AIS and radar/ARPA, and a visual scene, all of which are interfaced to the ECDIS. Lecturing without demonstration is conducted in the same ECDIS classroom with the workstations powered down.

Simulation lab - Trainees develop and demonstrate proficiencies in an Integrated Navigation Lab (INL) setting, where each trainee has use (either alone or in groups of no more than two) of an ownship in semi-isolation (Bridge). The Integrated Navigation Lab (INL) should run the same simulation application

as in the ECDIS classroom, except that each bridge consists of four uniquely dedicated PCs: ECDIS with trackball and keyboard, conning and control, radar/ARPA, and visualization channel displayed on a large flat screen. As in the ECDIS classroom, all navigation functions should be integrated and interfaced to the ECDIS. There should also be a provision in each Bridge for plotting on standard paper charts, as well as VHF radio, either type-approved and de-amplified, or digitally embedded in the simulation software.

While exposure to a variety of ECDIS brands is encouraged, at a minimum, the particular brand and software version of the ECDIS used in the classroom (open lab) environment should match that which is used in the simulation lab. Trainees will benefit from gaining some familiarity with the approaches taken by different manufacturers to the ECDIS Performance Standards, especially with regards to menu structures and value-added options. However, the achievement of competency in safe navigation with ECDIS should occur through prolonged and in-depth practice with one particular ECDIS common to both training environments.

Materials - Screen projection through PC and document reader, CBT and PC presentations, hard-copy handouts, and sample ECDIS interfaces on CD

Simulation software - The integrated navigation simulation application installed in the ECDIS classroom and Integrated Navigation Lab as outlined above should include type-approved ECDIS software to which the simulation delivers sensor input in an underway context. Assessment and evaluation systems built into the simulation software offer considerable benefits, especially by unobtrusive and objective measure of "safe navigation" parameters; its inclusion and application especially in route monitoring exercises is encouraged.

■ Recommended ECDIS simulation performance standards

ECDIS is an integrating device, and its use should be mastered in solo watchstanding. It follows that ECDIS simulation should suit solo watchstanding training, and this certainly demands the inclusion of the visual scene at all times. ECDIS simulation equipment should be capable of simulating the operational capabilities of ECDIS which meet all applicable performance standards adopted by the Organization, and should optimally incorporate the means to:

1) handle ENC data, licenses and update files
2) interface with the following emulated or OEM equipment:
   a) position indicator, including emulation of fix quality and, in the instance of GNSS, satellite constellation
   b) alternative position source
   c) heading indicator, true and magnetic, with graphic course recording
   d) speed indicator
   e) depth indicator
   f) ARPA tracked target data
   g) AIS, including control of static data and messaging
   h) radar data including emulated raw video, cursor, EBL and VRM
   i) autopilot capable of control by heading (course), COG, and track, where monitored track may be provided through both instructor control and alternatively through ECDIS at ownship
3) provide radar overlay, with functions operating independently from ownship radar
4) provide audio for navigation and assessment systems when fitted
5) provide VHF communications between all ownships and instructor
6) permit all ownships to interact with one another, depending on the exercise design
7) provide for viewing visual scene by scrolling in all directions horizontally and vertically, or horizontally without scrolling where fixed visual channels cover 360 degrees
8) provide for taking accurate visual bearing
9) permit simultaneous navigation on paper charts associated with area databases as appropriate to ECDIS watchstanding
10) provide adequate and well-lit surface for plotting on paper charts as the required means of back-up required for single ECDIS installation

In order to accomplish the goals of training and assessment included in this 2010 edition to the Model Course, ECDIS simulation should adhere to the foregoing as performance standards.

■ An optimal ECDIS training environment

It is the intent of this 2010 edition to the Model Course to recognize the growing practice of integrating ECDIS-supported navigation with the visual scene in simulation-based training. Additionally, since such detail surpasses the scope of STCW Code and Guidance, it is the intent also of the Framework to the 2010 edition of this Model Course to specify the optimal physical layout for such simulation training.

There is a fundamental difference between an instructor-led demonstration and practice of ECDIS functionalities, and the unassisted application of ECDIS while faced with navigational decision making. These are separate learning experiences. The following description of an optimal ECDIS training environment proposes that these be conducted separately. Nonetheless, all ECDIS workstations should have the same fully integrated simulation software package. Whether the lesson is being conducted in a classroom environment or the exercise is being conducted in the semi-isolation of a multiple ownship navigation lab, each network should be designed to run any combination of interacting ownships.

The following description of the classroom and lab is based on an ideal maximum of 12 trainees in a given iteration of the ECDIS training course, such that the entire group could be coached and instructed at once for extended periods in the classroom, and 6 at a time could be assigned solo watchstanding roles in the navigation lab for extended periods.

Optimal ECDIS classroom - Sit-down workstations for coaching (demonstration and practice of ECDIS functionalities)

Part	Function
12 sit-down workstations	Single PC, dual 19” LCD, specified VGA card, Win 7 O.S., ECDIS software and chart data installed on each, to provide: ➢ ECDIS-integrated ownships in classroom network, with total navigational and ship control (virtual) functionality in either independent or interactive underway contexts; ➢ ECDIS is displayed on one monitor, while split-screen visual scene and ship controls and instruments including radar are displayed (through menu selection) on the other monitor
1 instructor station	Single PC, dual 19” LCD, Win 7 O.S., simulator instructor control and monitoring software installed, to provide: ➢ Design, execution, and playback debrief of exercises
1 server / network	Single high-end PC with extra RAM, single 19” LCD, Win Server 2003 O.S., gigabit network, Cat 5e wiring at a minimum, simulator system software installed, including a suitable number of ownship models and training areas, to provide: ➢ Full network control (self-contained within classroom setting) ➢ Site for simulation software and all hydrodynamic modeling
Projection system	3 projectors, preferably linked to instructor station and both monitors from at least 1 workstation via matrix switching, to provide: ➢ Means for group demonstration of ECDIS functionality, and ownship control, and techniques of ECDIS-based navigation

Optimal ECDIS navigation lab - Semi-isolated ownships for stand-up solo watchstanding (unassisted application of ECDIS while faced with navigational decision making)

Part	Function
6 stand-up workstations (each with chart table and partitions)	Three PCs, three 19" LCDs, ECDIS software and chart data installed on each ECDIS PC; one PC with specified VGA card and 42" LCD, Win 7 O.S. on all, to provide: ➢ ECDIS-integrated ownships in lab network, with total navigational and ship control (virtual) functionality in either independent or interactive underway contexts; ➢ ECDIS, conning, radar, and visual scene are displayed separately and continuously ➢ Inclusion of steering and throttle hardware is a preferred enhancement in multiple ownship simulation
1 instructor station	Single PC, dual 19" LCD, Win 7 O.S., simulator instructor control and monitoring software installed, to provide: ➢ Design and execution of exercises ➢ Inclusion of remote assessment option is a preferred enhancement in multiple ownship simulation
1 server / network	Single high-end PC with extra RAM, single 19" LCD, Win Server 2003 O.S., gigabit network, Cat 5e wiring at a minimum, simulator system software installed, including a suitable number of ownship models and training areas, to provide: ➢ Full network control (self-contained within classroom setting) ➢ Site for simulation software and all hydrodynamic modeling

See Annex 4 of the 2010 edition of the Model Course for a brief example of integrated simulation training for developing proficiencies in ECDIS navigation.

■ Teaching Aids (A)

A1 IMO Model Course 1.27 (2010 Edition), Electronic Chart Display and Information Systems (ECDIS)

A1.1 Course Framework (Part A of the course)

A1.2 Instructor Manual (Part D of the course)

A2 Audiovisual aids: Video/DVD player, visual presentation, document projector, etc.

A3 Simulator providing ownship functionality in a visual underway navigational context

A4 Type-approved ECDIS including ENC data, deriving inputs from simulation or live sensors

A5 Electronic Navigational Chart (ENC) data, various, including permits, and update files

■ Bibliography (B)

B1 NMEA Interface Standard 0183 v.3.01 (Severna Park, MD, National Marine Electronic Association, 1/2002)

B2 *Facts about electronic charts and carriage requirements*, 2nd Ed. (Finnish Maritime Administration: Primar Stavanger and IC-ENC, 5/2007)

B3 Gale, H. (2009) *From Paper Charts to ECDIS.* London: Nautical Institute

B4 Bole, et al. (2005) *The Radar/ARPA Manual*, 2nd ed., Chapter 10 "Ancillary Equipment". Burlington, MA: Elsevier

B5 *American Practical Navigator* (Bowditch, Pub. No. 9), 2002 Ed., Chapter 14 "Electronic Charts"

B6 Simulator reference manual (Manufacturer, Date)

B7 User's manual accompanying the type-approve ECDIS software utilized during the training course (Manufacturer, Date)

■ Electronic media (E)

T1 *ECDIS*, Seagull CBT, CD #64

T2 *AIS*, Seagull CBT, CD #109 v.A, 8/2003

T3 *ECDIS Training Course,* Videotel CBT #871, 5/2008

■ IMO & regulatory references (R)

R1 *Standards of Training, Certification and Watchstanding for Seafarers (STCW Convention),* as amended

R2 1974 SOLAS Convention, Regulations V/19, V/20 and V/27, as amended 2009, IMO Res. MSC 282(86)

R3 Revised ECDIS Performance Standards, MSC.232(82), IMO, 12/2006

R4 ECDIS Performance Standards, IMO Resolution A.817(19) as adopted 11/1995, including Appendices 1 – 5, Appendix 6 as adopted 11/1996 Res. MSC.64(67), and Appendix 7 as adopted 12/1998 Res. MSC.86(70)

R5 S-52 *Specifications for chart content and display aspects of ECDIS*, 5th ed., as amended (IHB, 12/2001)

R6 S-100 *Universal Hydrographic Data Model*, Ed. 1.0.0 (Monaco: IHB, 1/2010)

R7 *Guidelines for Voyage Planning*, IMO Res. A.893(21)

R8 COLREGS - International Regulations for Preventing Collisions at Sea, 1972, as amended

R9 *IMO Model Course 1.27, The Operational Use of ECDIS*, 2000

■ Textbooks (T)

T1 Norris, A. (2010) *ECDIS and Positioning*. London: Nautical Institute

T2 Weintrit, A. (2009) *The Electronic Chart Display and Information System (ECDIS): An Operational Handbook.* Gydnia: Gydnia Maritime University

T3 Hecht, et al. (2006) *The Electronic Chart*, 2nd Ed. Lemmer, The Netherlands: GITC bv

Part B: Course Outline and Timetable

■ Overview

The following section presents the topics of the 40-hour ECDIS course in a simplified outline format. The 40 topics are organized into 5 general Subject Areas. The total hours are allocated in the following manner:

Practice & Lecture	Solo ECDIS navigation	Solo evaluation & Exam
27.5 hrs	**9.0 hrs**	**3.5 hrs**

The duration allocated to each topic is presented in the Course Timetables, and is repeated in Part C – Detailed Teaching Syllabus, and in Part D – Lesson Plans and Exercises. The Learning Objectives for each topic are presented generally in Part C, and with full detail in Part D.

As defined in Part A – Course Framework, the Classroom (open lab) setting should provide one workstation for each trainee, and all workstations should be networked to the simulation instructor and server such that each station offers a visual ownship including ECDIS and radar. The Integrated Navigation Lab (INL) should consist of a sufficient number of isolated ownships similarly networked such that all functions run on separate PCs and displays, and is approved by the national authority for ECDIS instruction.

With an open lab and INL arrangement of teaching facilities, most topics can be very effectively presented in a combination of demonstration and lecture. Further distinction of these modes is therefore not required.

■ Course Outline - Total 40.0 hours minimum

Subject Area and topics	Hours
Elements of ECDIS	**10.5**
1. Course introduction & familiarization plan	
2. Purpose of ECDIS	
3. Value to navigation	
4. Correct & incorrect use	
5. Work station start, stop & layout	
6. Vessel position	
7. Position source	
8. Basic navigation	
9. Heading & drift vectors	
Ex.1 Simulator exercise – open sea (basic integrated navigation)	
10. Understanding chart data	
11. Chart quality & accuracy	
12. Chart organization	

Subject Area and topics	Hours
Watchstanding with ECDIS 13. Sensors 14. Ports & data feeds 15. Chart selection 16. Chart information 17. Changing the settings 18. Chart scaling 19. Information layers Ex.2 Simulator exercise – coastal waters (chart display settings) 20. System & position alarms 21. Depth & contour alarms	**8.0**
ECDIS Route Planning 22. Vessel maneuvering characteristics 23. Route planning by table 24. Route planning by chart 25. Track limits 26. Checking plan for safety Ex.3 Simulator exercise – coastal & confined waters (navigation alarms & route scheduling) 27. Embedded tide, current & climate almanac 28. Route schedule 29. User charts in route planning	**7.0**
ECDIS Targets, Charts & System 30. ARPA tracked target overlay 31. AIS functions 32. Radar overlay (RIB) functions 33. Procuring & installing chart data 34. Installing chart corrections Ex.4 Simulator exercise – confined waters (advanced integrated navigation with ECDIS) 35. System reset & backup 36. Archiving with ECDIS data management utility 37. Data logging and logbook 38. Playback	**8.5**
ECDIS Responsibility & Assessment 39. Responsibility 40. Effective navigation with ECDIS Ev.1 Written evaluation Ev.2 Simulator exercise – coastal & confined waters (underway ECDIS navigation assessment)	**6.0**

■ **Course Timetable – 5 days, 40.0 hours minimum**

Period Day	1st Period (2.0 hours)	2nd Period (1.5 hours)	3rd Period (2.0 hours)	4th Period (2.5 hours)
Day 1	**Elements of ECDIS** 1. Course introduction & familiarization plan 2. Purpose of ECDIS 3. Value to navigation 4. Correct & incorrect use	5. Work station start, stop & layout 6. Vessel position 7. Position source	8. Basic navigation 9. Heading & drift vectors 10. Understanding chart data	Ex.1 Simulator exercise – open sea (basic integrated navigation)
Day 2	11. Chart quality & accuracy 12. Chart organization **Watchstanding with ECDIS** 13. Sensors 14. Ports & data feeds	15. Chart selection 16. Chart information	17. Changing the settings 18. Chart scaling 19. Information layers	Ex.2 Simulator exercise – coastal waters (chart display settings)
Day 3	20. System & position alarms 21. Depth & contour alarms	**ECDIS Route Planning** 22. Vessel maneuvering characteristics 23. Route planning by table	24. Route planning by chart 25. Track limits 26. Checking plan for safety	Ex.3 Simulator exercise – coastal & confined waters (navigation alarms & route scheduling)
Day 4	27. Embedded tide, current & climate almanac 28. Route schedule 29. User charts in route planning	**ECDIS Targets, Charts & System** 30. ARPA tracked target overlay 31. AIS functions 32. Radar overlay (RIB) functions	33. Procuring & installing chart data 34. Installing chart corrections	Ex.4 Simulator exercise – confined waters (advanced integrated navigation with ECDIS)
Day 5	35. System reset & backup 36. Archiving with ECDIS data management utility 37. Data logging and logbook 38. Playback	**ECDIS Responsibility & Assessment** 39. Responsibility	40. Effective navigation with ECDIS Ev.1 Written evaluation	Ev.2 Simulator exercise – coastal & confined waters (underway ECDIS navigation assessment)

Part C – Detailed Teaching Syllabus

The detailed teaching syllabus has been written in learning objective format in which the objective describes what the trainee should do to demonstrate that knowledge has been transferred. All objectives are understood to be prefixed by the words, "The expected learning outcome is that the trainee…"

In order to assist the instructor, reference publications are shown against the learning objectives in addition technical material and teaching aids, which the instructor may wish to use when preparing course material. The material listed in the course framework has been used to structure the detailed teaching syllabus; in particular, teaching aids (indicated by A) and references (indicated by B, E, R, or T) will provide valuable information to instructors.

The abbreviations used are:

add.:	Addendum	p.:	Page
app.:	Appendix	pa.:	Paragraph
art.:	Article	reg.:	Regulation
ch.:	Chapter	sect.:	Section
encl.:	Enclosure	tab.	Table

The following are examples of the use of references:

R1 tab. A-II/2 refers to Table A-II/2 training requirements of STCW 1978, as amended (2010);

AI.2 sect. 1 refers to training section 5 ("Elements of ECDIS") in the guidance notes of the instructor manual (Part D) of the 2010 edition of this Model Course.

T3 ch.1 refers to Chapter 1 of the textbook edition designated as T3

■ Note

Throughout the course, safe working practices are to be clearly defined and emphasized with reference to current international requirements and regulations. It is expected that the institution implementing the course will insert references to national and/or regional requirements and regulations as necessary.

■ Learning Objectives

Subject Areas and topics have been outlined in Part B. In Part C, the Learning Objectives associated with each topic are provided, along with teaching aids and references. In Part D, the topics are referred to as Lesson Plans, and the Learning Objectives are further described in sufficient detail for the development of an ECDIS Instructor's Manual. The Learning Objectives are presented in a verb-based manner to facilitate outcomes-driven learning and skills development. All Learning Objectives are understood to be prefixed by the phrase: "The expected learning outcome is that the trainee is able to . . . ."

Bear in mind that the overarching competencies to be developed throughout the course are the "use of ECDIS to maintain the safety of navigation" (STCW, Operational Level) and "maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making" (STCW, Management Level). The ECDIS instructor should strive to present all of the Learning Objectives in or as close to the contexts of underway navigation as possible. Through practice and understanding of these Learning Objectives as tasks to master and apply, the trainee achieves the desired competence and which the instructor may assess in the scored final underway evaluation.

Learning Objectives	Teaching Aid	Reference
Elements of ECDIS (10.5 hours)		
1. Course introduction & familiarization plan (0.5 hours) 1.1. General introductions 1.2. Administration 1.3. Familiarization with ECDIS learning environment	A1.1 A3 A4	T3 ch.1 B6 B7
2. Purpose of ECDIS (0.5 hours) 2.1. Introduce revised IMO Performance Standards for ECDIS (June 2006, Resolution MSC.232(82)) 2.2. Differentiate between display options 2.3. Identify information types and areas on navigation display 2.4. Apply presentation of ECDIS data	A1 A1.2 A2 A3 A4 A5	R3 T1 ch.3 & 10.3 T3 ch.2 B4 ch.10.2 B5 ch.14
3. Value to navigation (0.5 hours) 3.1. Recognize factors that characterize and modify chart presentation 3.2. Recognize factors that characterize and modify the data quality 3.3. Manually change scale, area & position of ownship 3.4. Evaluate the route monitoring mode of ECDIS operation 3.5. Explain the value of ECDIS to navigation	A1.2 A2 A3 A4 A5	T1 ch.6.8 T1 ch.8.5 T3 ch.11.1 & 11.2 B4 ch.11.2.2 & 11.2.3 & 11.3
4. Correct & incorrect use (0.5 hours) 4.1. Use ECDIS within the prevailing navigation situation 4.2. Recognize ways to avoid over-reliance on ECDIS 4.3. Proficiency in the use of ECDIS includes assessing the integrity of the system and all data at all times	A1.2 A2 A3 A4 A5	T1 ch.8.7 T3 ch.11.3.2 & 7.5 & 8.1.1 B2 B3
5. Work station start, stop & layout (1.0 hour) 5.1. Perform standard PC start 5.2. Interpret the ECDIS start windows for sensors requested, sensors found, and selected chart data initializing 5.3. Examine alarms (if any) and determine initial conditions of ECDIS readiness for navigation	A1.2 A2 A3 A4 A5	T1 ch.1 T3 ch.7.3 B7
6. Vessel position (0.5 hours) 6.1. Review user interface methods 6.2. Review display of vessel's position 6.3. Examine position information in the display panels 6.4. Determine a position fix on the ECDIS chart display panel	A1.2 A2 A3 A4 A5	T1 ch.6.7 B7
7. Position source (1.0 hour) 7.1. Review basics of GPS 7.2. Coordinate GPS antenna position settings 7.3. Select position system 7.4. Determine fix quality (status) of GPS	A1.2 A2 A3 A4 A5	T1 ch.2 T3 ch.7.5.5 & 8.1.1 B7

Learning Objectives	Teaching Aid	Reference
8. Basic navigation (1.0 hour) 8.1. Activate display categories and information layers 8.2. Monitor vessel safety 8.3. Activate route monitoring features	A1.2 A2 A3 A4 A5	T1 ch.6.2 B7
9. Heading & drift vectors (0.5 hours) 9.1. Activate vessel's motion vectors 9.2. Obtain vessels' course and speed from the positioning system 9.3. Interpret the movement of the vessel 9.4. Recognize the effects of gyro error 9.5. Graphically monitor ownship's approach to isolated dangers by means of a guard ring	A1.2 A2 A3 A4 A5	T1 ch.8.1 R3 R4 B7
Ex.1 Simulator exercise – open sea (basic integrated navigation) (2.5 hours)	A3, A4, A5	
10. Understanding chart data (1.0 hour) 10.1. Define the relevant terminology of ECDIS 10.2. Describe the differences between electronic chart systems and ECDIS 10.3. Describe the various electronic chart data formats 10.4. Explain the relationship between ECDIS data and the information presented on the display 10.5. Explain that only information stored as objects with corresponding attributes in the database is available for display 10.6. Describe the chart data selected for display	A1.2 A2 A3 A4 A5	T1 ch.1 & 4 T3 ch.4 & 7.2 & 6 B5 ch.14 B7
11. Chart quality & accuracy (0.5 hours) 11.1. Explain what the accuracy of chart data is dependent upon 11.2. Explain the problems in ECDIS associated with variant datums 11.3. Assess all errors, inaccuracies and ambiguities caused by improper data management 11.4. Explain the need and requirement that electronic chart data must be systematically updated for safe navigation 11.5. Demonstrate issues pertaining to computer monitor display resolution	A1.2 A2 A3 A4 A5	T1 ch.9 T3 ch.5 B7
12. Chart organization (0.5 hours) 12.1. Introduce the organization of chart data distribution 12.2. Demonstrate the loading (retrieval) of ECDIS data	A1.2 A2 A3 A4 A5	T1 ch.6.3 T3 ch.10 & 7.2.2 B7

Learning Objectives	Teaching Aid	Reference
Watchstanding with ECDIS (8 hours)		
13. Sensors (0.5 hours) 13.1. Explain the performance limits of devices for position, course over ground, heading, speed, depth, radar, and AIS 13.2. Explain the need for selecting sensor data displayed in ECDIS that is appropriate, unambiguous and accurate 13.3. Evaluate the impairment of ECDIS performance when sensor performance deteriorates 13.4. Explain and analyze various sensor alarms and indications	A1.2 A2 A3 A4 A5	T1 ch.2.16 & 6.1 & 6.5.1 T3 ch.8 B7
14. Ports & data feeds (0.5 hours) 14.1. Select between primary and secondary position source 14.2. Observe automatic change over to secondary position source 14.3. Explain the data reference system of each connected sensor 14.4. Identify the data port assigned to each connected sensor 14.5. Monitor, identify and to a limited extent decode the data stream for each attached sensor 14.6. Assess the plausibility of sensor input values to ECDIS 14.7. Assess the impact on displayed information when a sensor port is improperly selected	A1.2 A2 A3 A4 A5	T1 ch.8.2 & 8.3 B4 ch.10.4 B7
15. Chart selection (0.5 hours) 15.1. Demonstrate the variety of methods that chart data can be loaded and changed (called into display) 15.2. Assess the inaccuracies and ambiguities caused by improper selection of a chart for display 15.3. Display updates in order to review content and to establish their inclusion in the SENC 15.4. Explain and analyze the data and chart alarms resulting from over-scaling 15.5. Explain and analyze the data and chart alarms resulting from use of a non-WGS84 datum	A1.2 A2 A3 A4 A5	T1 ch.6.4 & 9.1 T3 ch.5.3 & 7.2 B7
16. Chart information (1.0 hour) 16.1. Select the task panel and apply the functions suitable for position monitoring, route monitoring, route creation and editing, trial maneuver, creating and accessing user-defined layers 16.2. Obtain information on charted objects 16.3. Demonstrate how the presentation of navigation marks is changed according to Own Ship position 16.4. Demonstrate errors of interpretation by the incorrect selection of display categories	A1.2 A2 A3 A4 A5	T1 ch.6.4.6 T3 ch.7.2 B7

Learning Objectives	Teaching Aid	Reference
17. Changing the settings (1.0 hour) 17.1. Manually test the major functions of hardware, keyboard, mouse / trackball, sensor data, and chart data 17.2. Check and / or select preferred operational settings in the primary task panels and on the primary information panel 17.3. Evaluate alarm and function status indications 17.4. Demonstrate errors of interpretation by the incorrect selection of safety values 17.5. Adjust track length and precision 17.6. Evaluate the range of information recorded in the log table (voyage recording)	A1.2 A2 A3 A4 A5	T1 ch.6.3 & 8.6 T3 ch.7.6 B7
18. Chart scaling (0.5 hours) 18.1. Demonstrate scaling of electronic chart display 18.2. Apply the automatic changing of chart scale ratio 18.3. Apply additional chart scale information 18.4. Recognize interpretation errors due to scaling	A1.2 A2 A3 A4 A5	T1 ch.6.4 T3 ch.7.2.4 B7
19. Information layers (0.5 hours) 19.1. Observe effect on information layers and status indications when chart data is loaded and when chart area is underscaled 19.2. Review and apply appropriate day/night palette, display category, and scale 19.3. Select information options in display category of “All other information” 19.4. Differentiate between information layers, User Chart layers, and Event graphic 19.5. Respond to the indicators representing the loss of displayed information	A1.2 A2 A3 A4 A5	T1 ch.6.5 & 6.9 & 7.3 T3 ch.7.5.6 & 7.2.1 & 7.3.2 B7
Ex.2 Simulator exercise – coastal waters (chart display settings) (2.0 hours)	A3, A4, A5	
20. System & position alarms (0.5 hours) 20.1. Identify and respond to alarms for primary and secondary positioning systems 20.2. Identify and respond to chart related alarms 20.3. Identify and respond to ECDIS alarms from autopilot in Track Control	A1.2 A2 A3 A4 A5	T1 ch.8.3 T3 ch.7.5.3 B7
21. Depth & contour alarms (1.0 hour) 21.1. Describe route monitoring alarms 21.2. Identify depth-related information 21.3. Set the safety values for route monitoring 21.4. Set the limits pertaining to safe water	A1.2 A2 A3 A4 A5	T1 ch.8.4 & 6.5 T3 ch.7.5 B7

Learning Objectives	Teaching Aid	Reference
ECDIS Route Planning (7.0 hours)		
22. Vessel maneuvering characteristics (0.5 hours) 22.1. Select appropriate turning criteria for efficient and effective use of Autopilot in heading control mode 22.2. Correlate rudder limits in Autopilot with turning radii and rates of turn for curved track planning on ECDIS 22.3. Determine methods of alert for wheel over when approaching waypoints 22.4. The navigator must verify positioning especially when ECDIS is connected to auto pilot	A1.2 A2 A3 A4 A5	T1 ch.8.5 T3 ch.7.5 & 8.3 B7
23. Route planning by table (0.5 hours) 23.1. Retrieve a stored route plan 23.2. Approve an existing route for planning, safety review and monitoring 23.3. Select the sea areas and the required waters for planning the whole passage 23.4. Construct a route plan by inputting waypoint data alphanumerically into a route-planning table 23.5. Adjust the route plan by editing, adding and deleting waypoints inside the table 23.6. Adjust curved track planning and wheel over indication 23.7. Establish procedures to name, link, rename, archive, retrieve and delete route files	A1.2 A2 A3 A4 A5	T1 ch.7.1 & 7.5 T3 ch.7.4 B7
24. Route planning by chart (1.0 hour) 24.1. Select the sea areas and the required waters for planning the whole passage 24.2. Construct a route by inputting waypoints directly on the ECDIS display 24.3. Adjust the route by graphically editing waypoints 24.4. Obtain track courses and distances from the chart 24.5. Obtain relevant route planning information	A1.2 A2 A3 A4 A5	T1 ch.7.2 & 7.3 T3 ch.7.4 B7
25. Track limits (0.5 hours) 25.1. Review the alarm settings used as vessel is proceeding along a monitored route 25.2. Modify the setting of XTE in a previously saved route	A1.2 A2 A3 A4 A5	T1 ch.6.5.3 & 8.3 T3 ch.7.5 B7

Learning Objectives	Teaching Aid	Reference
26. Checking plan for safety (0.5 hours) 26.1. Check a previously created and saved route for crossing dangers of navigation according to the setting of cross-track distance 26.2. Check the route as it is being created for dangers as listed above 26.3. Assess a route plan based on a safety check	A1.2 A2 A3 A4 A5	T1 ch.7.4 & 7.7 T3 ch.7.4 B7
Ex.3 Simulator exercise – coastal & confined waters (navigation alarms & route scheduling) (2.0 hours)	A3, A4, A5	
27. Embedded tide, current & climate almanac (0.5 hours) 27.1. Determine the force and direction of the true wind 27.2. Display the ocean climate wind vectors and lines of equal wave height, selected by month 27.3. Display the dynamics of surface currents 27.4. Determine the tidal rise and tidal currents 27.5. Use Current option in calculating a Route Plan Schedule 27.6. Determine bottom type and assess anchor holding ground from information obtained on an appropriately scaled chart	A1.2 A2 A3 A4 A5	T3 ch.7.5 & 7.7 & 15.1 B7
28. Route schedule (0.5 hours) 28.1. Observe any deviation from the route schedule setting in use as vessel is proceeding along a route 28.2. Determine expected passage times 28.3. Observe calculations of progress along the planned route 28.4. Using the ETA application in ECDIS, calculate time or speed at a selected waypoint on a monitored route	A1.2 A2 A3 A4 A5	T1 ch.7.5 T3 ch.7.5 & 7.7 B7
29. User charts in route planning (1.0 hour) 29.1. Review the ECDIS function for creating mariner's notes (User Chart) 29.2. Determine effective policy regarding User Charts 29.3. Select User Chart for display 29.4. Use the graphic editor for creating and modifying a User Chart 29.5. Create, save and move an anchor circle guard zone as a User Chart	A1.2 A2 A3 A4 A5	T1 ch.7.3 T3 ch.7.3 B7
ECDIS Targets, Charts & System (8.5 hours)		
30. ARPA tracked target overlay (0.5 hours) 30.1. Examine sensor setup requirements for ARPA tracked targets 30.2. Determine speed and heading inputs used in ARPA tracked target data calculations 30.3. Access target info display 30.4. Interpret target symbol features	A1.2 A2 A3 A4 A5	T1 ch.8.4.3 T3 ch.8.2.3 & 8.5 B7

Learning Objectives	Teaching Aid	Reference
31. AIS functions (0.5 hours) 31.1. Describe what the connection of an Automatic Identification System (AIS) to ECDIS enables 31.2. Examine sensor setup requirements for AIS targets 31.3. Determine alarms and other settings for AIS targets 31.4. Access target info display options 31.5. Interpret AIS target symbol features	A1.2 A2 A3 A4 A5	T1 ch.8.4.5 & 6.9 T3 ch.8.4 B4 ch.10.3 B7
32. Radar overlay (RIB) functions (0.5 hours) 32.1. Describe the technical function of the radar integrator board (RIB) hardware 32.2. Examine the main functions of the radar integrator board 32.3. Operate the user interface controls for radar overlay 32.4. Demonstrate sources of image offset 32.5. Determine source of ECDIS-tracked target data calculations	A1.2 A2 A3 A4 A5	T1 ch.8.4.4 T3 ch.8.2.1 & 8.2.2 & 11.1.5 B7
33. Procuring & installing chart data (1.0 hour) 33.1. Review chart data structure, terminology, and installation procedures. 33.2. Review chart format requirements for ECDIS 33.3. Examine data distribution sources for ENC 33.4. Examine data distribution sources for SENC conversions 33.5. Examine license structure for various formats, and practice installation 33.6. Examine license structure for various formats, and practice installation 33.7. Extract information on installation history	A1.2 A2 A3 A4 A5	T1 ch.4.4 T3 ch.9.2 & 9.3 & 9.4 B7
34. Installing chart corrections (1.0 hour) 34.1. Explain why electronic chart data is maintained with up-to-date corrections 34.2. Add or modify a chart object using Manual Correction task 34.3. Examine production license options for accessibility of automatic updates 34.4. Install various automatic update formats using various methods 34.5. Extract information on update history	A1.2 A2 A3 A4 A5	T1 ch.4.5 & 6.3 T3 ch.10 B7
Ex.4 Simulator exercise – confined waters (advanced integrated navigation with ECDIS) (2.5 hours)	A3, A4, A5	
35. System reset & backup (0.5 hours) 35.1. Explain the intent of regulations on ECDIS back-up arrangements 35.2. Perform back-up procedures in standalone ECDIS failure event 35.3. Perform networked back-up procedures in (Master) ECDIS failure event 35.4. Perform troubleshooting routines in ECDIS 35.5. Recognize consequences to navigation safety while troubleshooting, 35.6. Recognize consequences to data storage while ECDIS PC is down	A1.2 A2 A3 A4 A5	T1 ch.8.7 & 8.8 T3 ch.11.3 & 11.4 B7

Learning Objectives	Teaching Aid	Reference
36. Archiving with ECDIS data management utility (0.5 hours) 36.1. Use ECDIS data management utility to work with files associated with ECDIS operations 36.2. Use ECDIS data management utility to transfer select data files between storage media	A2 A4	B7
37. Data logging and logbook (1.0 hour) 37.1. Examine requirements and functions of logbook task in ECDIS 37.2. Examine display functions of ownship track and tracks of AIS, ARPA and RIB targets 37.3. Perform various hard copy print outs	A1.2 A2 A3 A4 A5	T1 ch.8.6 T3 ch.7.6 & 13.9 B7
38. Playback (0.5 hours) 38.1. Explain the disruption of ECDIS when operating Playback utility 38.2. Explain that no route or route plan is securely associated with any playback 38.3. Explain that no chart data is securely associated with any playback 38.4. Perform a playback of an event or passage specified by date and time 38.5. Closely observe the position and heading update interval in Playback 38.6. During playback, analyze the logbook for the quality of navigation	A1.2 A2 A3 A4 A5	T3 ch.7.6 B7
ECDIS Responsibility & Assessment (6.0 hours)		
39. Responsibility (1.5 hours) 39.1. Re-examine COLREGS – implicit 39.2. Re-examine SOLAS, as amended – explicit 39.3. Re-examine IMO approval of equipment and installations 39.4. Re-examine IMO carriage requirements 39.5. Re-examine national ECDIS carriage regulations 39.6. Re-examine STCW Code, as amended 39.7. Re-examine flag state (maritime) implementation 39.8. Re-examine IMO training Guidance (and providing review of course) 39.9. Re-examine ISM requirements of ship owners & operators	A1.2 A2	R1 R3 R5 R6 R7 T1 ch.5 T3 ch.13.4
40. Effective navigation with ECDIS (1.0 hour) 40.1. Describe bridge functions incorporating ECDIS 40.2. Re-examine sample bridge operating procedures addressing ECDIS 40.3. Define safe and practical navigation with ECDIS 40.4. Examine evolving concepts of e-Navigation with regards to ECDIS	A1.2 A2	T1 ch.10.2 T3 ch.7.3 & 8.1 & 11.2 & 16
Ev.1 Written evaluation (1.0 hour)		
Ev.2 Simulator exercise – coastal & confined waters (underway ECDIS navigation assessment) (2.5 hours)	A3, A4, A5	

Part D – Instructor Manual

■ Guidance for instructors

The course outline and timetable (Part B) provide guidance on the time allocation for the course material, but the instructor is free to modify this if it is deemed necessary. The detailed teaching syllabus (Part C) must be studied carefully and, where appropriate, lesson plans or lecture notes compiled with Part D providing the basis from beginning to end of the course. The written and practical exam content and methods are detailed in Part E.

The lesson plans and exercises of this part are meant to provide the ECDIS navigation instructor with the material for a course instruction manual. Specifically, the Learning Objectives presented in the previous parts of the Model Course document are fleshed out in considerable detail in Part D. The details of this part reflect the views of the course developers with respect to methodology and organization as well as what they consider relevant and important in light of their experience as instructors and as navigator who have succeeded in applying ECDIS to bridge watchstanding. Although the lessons, exercises, and assessment methods should be of value initially, each instructor should develop his/her own methods and ideas, recognize and refine what is successful, and discard that which does not work satisfactorily. It is particularly important for the instructor to adapt content to the specific ECDIS being utilized in the training environment. Despite the ECDIS Performance Standards, there is limited commonality among type-approved ECDIS units. Adaptation is also advised for review of flag state regulations, as appropriate.

As noted in the foregoing parts, this 40-hour course is comprised of 40 Lesson Plans, 4 practice exercises, and a final underway assessment exercise. These are divided according to the five primary stages of the course:

1 Elements of ECDIS (10.5 hours)

2 Watchstanding with ECDIS (8.0 hours)

3 ECDIS Route Planning (7.0 hours)

4 ECDIS Charts, Targets & System (8.5 hours)

5 ECDIS Responsibility (6 hours)

Preparation and planning are the most important criteria in effectively presenting this course. Availability and proper use of course materials is also essential for maximum efficacy in conveying the subject to trainees. The capabilities and limitations of the teaching facilities in use may dictate that the learning objectives be adjusted but it is suggested that this be kept to a minimum.

Due to the considerable challenges and complexities faced by trainees learning to navigate safely using ECDIS, it is vital for the instructor to recognize that successful underway assessments require as much hands-on practice as possible. As discussed in the Introduction to the navigational use of ECDIS (2010 Edition), lecturing and demonstration and the opportunity for individual use applies to nearly all learning objectives in nearly all topics. Whenever an ECDIS unit must be shared amongst trainees, the quality of learning is critically degraded, and leads to likely failure in the final underway assessment. It will, therefore, be necessary for instructors to prepare for the presentation of specific learning objective in the context of underway scenarios for both classroom demonstration and practice, and for the solo navigation environment. The development of other materials, such as a compilation on a CD of handy reference material, is also strongly suggested. An index of useful files and documents is provided in the “Appendices for the Instructor” part of this course.

■ Lesson Plans: Elements of ECDIS (10.5 hours)

1. Introduction & familiarization plan (0.5 hours)
2. Purpose of ECDIS (0.5 hours)
3. Value to navigation (0.5 hours)
4. Correct & incorrect use (0.5 hours)
5. Work station start, stop & layout (1.0 hour)
6. Vessel position (0.5 hours)
7. Position source (1.0 hour)
8. Basic navigation (1.0 hour)
9. Heading & drift vectors (0.5 hours)
10. Understanding chart data (1.0 hour)

Ex.1 Simulator Exercise – Open sea (basic integrated navigation) (2.5 hours)

11. Chart quality & accuracy (0.5 hours)
12. Chart organization (0.5 hours)

1. Introduction & familiarization plan (0.5 hrs)

The trainee explains the goals of the 40-hour course; and becomes familiar with the layout of the ECDIS equipment at the workstations and on the bridge simulator (Refs: T3 ch.1; B6; B7).

1.1. General introductions:
- Define the goals of the course and course certification,
- Verify that all trainees have basic computer skills (objective assessment)
- Explain the course structure and attendance requirements,
- Explain the evaluation process
- Explain that trainees will achieve an understanding of type-approved ECDIS in general, and proficiency specifically in the use of system in use in the course

1.2. Administration:
- Issue study guides and other reference material,
- Review course syllabus

1.3. Familiarization with ECDIS learning environment
- Work station power-up and ECDIS software start and stop,
- Use the projector to show how you will demonstrate ECDIS functions,
- Explain how to get information from the ECDIS User Manuals,
- Explain Help structure within ECDIS software package, and
- Briefly tour classroom and lab used for ECDIS navigation training to see navigation and control equipment.

2. Purpose of ECDIS (0.5 hrs)

The trainee explains the main characteristics of ECDIS data display, and recognizes which information is constantly displayed by ECDIS and which is selectable (Refs: R3; T1 ch.3 & 10.3; T3 ch.2; B4 ch.10.2; B5 ch.14).

2.1. Introduce revised IMO Performance Standards for ECDIS (June 2006, Resolution MSC.232(82)):
- ECDIS definition,
- Capability of displaying all chart information necessary for safe and efficient navigation,
- Swiftly enables positioning, route monitoring and route planning,

- Provides appropriate alarms and indications.

2.2. Differentiate between display options:
- Electronic navigational chart (ENC) and system ENC (SENC),
- Standard display and display base,
- Display of information other than ENC data.

2.3. Identify information types and areas on navigation display:
- Electronic chart area, Information area, Task panels, other menu options,
- Automatic displays for monitoring ship's safety including position, gyro heading, speed log, time, and safety values, course over ground and speed over ground.

2.4. Apply presentation of ECDIS data:
- Major rules of presentation library,
- Automatic presentation, such as scale, display category, day/night, etc.,
- Modes, such as true motion and North-up.

3. Value to navigation (0.5 hrs)

The trainee recognizes that safe navigation with ECDIS requires the selection and analysis of displayed information that is relevant to the prevailing situation (Refs: T1 ch.6.8; T1 ch.8.5; T3 ch.11.1 & 11.2; B4 ch.11.2.2 & 11.2.3 & 11.3).

3.1. Recognize factors that characterize and modify chart presentation:
- Projection, colors, symbols,
- Assessment of differences.

3.2. Recognize factors that characterize and modify the data quality:
- Accuracy, resolution, completeness,
- Assessment of differences.

3.3. Manually change scale, area & position of ownship:
- Chart (or sea) area and scale,
- Position of own hip relative to display edge

3.4. Evaluate the route monitoring mode of ECDIS operation:
- Route monitoring mode,
- Navigation mode.

3.5. Explain the value of ECDIS to navigation:
- Own ship position with respect to route, shipping lanes, acquired targets, depth contours, soundings, and predicted tides and currents,
- Multi-chart loading, scaling, on-chart object info,
- Centralized information station for navigational bridge team, including ERBL, user layers, radar target tracking, SAR, Navtex, AIS, climate, and port info.

4. Correct & incorrect use (0.5 hrs)

The trainee assesses ECDIS as a tool which aids but does not replace proper navigational watchkeeping (Refs: T1 ch.8.7; T3 ch.11.3.2 & 7.5 & 8.1.1; B2; B3).

4.1. Use ECDIS within the prevailing navigation situation:
- Name the principles of navigation and operational guidance for officers in charge of a navigational watch (STCW, SOLAS),
- Review the many areas of bridge operations to which ECDIS may be applied,
- Situational awareness includes the functioning of navigational aids and the reliability of sensors,

- ECDIS is only a tool designed to support the mariner performing navigational tasks,
- A navigational watch is not to be performed on only one system (mostly unavoidable in this simulation and proficiency training)

4.2. Recognize ways to avoid over-reliance on ECDIS
- A system malfunction and data inaccuracy is always a potential,
- The displayed hydrographic data are not more reliable than the survey data they are based on,
- The displayed sensor data are not more reliable than the respective originating sensor system,
- Errors / inaccuracies in one subsystem may degrade others and can potentially render ECDIS useless.

4.3. Proficiency in the use of ECDIS includes assessing the integrity of the system and all data at all times.
- However, such use should be integrated into standing a normal watch including a competent visual lookout, and the continued maintenance of good situational awareness.
- One method of accomplishing this it to go to the ECDIS with a single purpose or query within a strict and brief time limit, rather than to browse or surf menus and information panels. Keeping to a 7-second glance as a scanning technique helps produce an integrative role for ECDIS.
- Another method is to overcome the problem of partial use – the less thoroughly the ECDIS is used and applied, the less willing the users become to apply ECDIS to navigation, resulting less familiarity and less trust.

5. Work station start, stop & layout (1.0 hr)

The trainee analyzes and assesses the proper functioning of ECDIS during the booting-up process and normal operation (Refs: T1 ch.1; T3 ch.7.3; B7).

5.1. Perform standard PC start:
- Recognize that some sensor feeds may need to be off or disconnected to PC com ports, and that the PC is subject to all normal limitations of hardware, operating system, and memory
- ECDIS is a navigation aid (not a general use PC) and has:
  - Potential limitations in hard drive storage, RAM size, power supply interruptions, hardware malfunctions, overall system lockup, etc.,
  - Operating system (typically Windows) boot-up procedures and internal tests,
  - A pre-programmed “dongle” installed in the parallel printer port which enables the registration and use of the ECDIS manufacturer’s products
  - The potential to fail due to incorrect use of OS and ECDIS software.

5.2. Interpret the ECDIS start windows for sensors requested, sensors found, and selected chart data initializing:
- Recognize the significance of the ECDIS Activator Key (dongle) and associated license files
- The ECDIS software boots up (loads) with:
  - A small indicator window against the desktop background, then
  - A full screen panel indication of initialization, then
  - The ECDIS basic display with alarm indicators (if any) requiring acknowledgement.

5.3. Examine alarms (if any) and determine initial conditions of ECDIS readiness for navigation
- The ECDIS initialization screen indicates on-line tests:
  - For date/time, position, heading, and speed log,
  - Displays “Received” when these inputs match expected protocols (“Received” status is not a check on data accuracy),
  - Displays “Aborted” when these inputs are missing or corrupt,
  - Boot-up without inputs will continue, with alarms on ECDIS display,
  - ENC data will be loaded from the chart files as licensed.

6. Vessel position (0.5 hrs)

The trainee operates basic navigational functions and settings pertaining to vessel position information (Refs: T1 ch.6.7; B7).

6.1. Review interface methods:
- Mouse / trackball and device buttons,
- Keyboard and hotkeys,
- Control of standard cursor and free mouse cursor,
- Use of cursor and ERBL on the display.

6.2. Review display of vessel's position:
- Shift the vessel on the display in navigation mode
- Vessel's symbols
- Vessel's GPS position information (details reviewed in Lesson 07),
- Track of vessel's position (details reviewed in Lesson 08),
- Vessel's motion vectors (details reviewed in Lesson 09).

6.3. Examine position information in the display panels:
- System (tidal height, current, sounding, set and drift at position),
- Route (vessel position on the route),
- Pilot (position relative to next WP as per route schedule data).

6.4. Determine a position fix on the ECDIS chart display panel:
- Manually draw and move bearing lines (LOPs),
- Manually mark position on the display

7. Position source (1.0 hrs)

The trainee recognizes the principle features of DGPS as the primary vessel position source (Refs: T1 ch.2; T3 ch.7.5.5 & 8.1.1; B7).

7.1. Review basics of GPS:
- Satellite constellation, theory, atmospheric interference,
- Signal quality indication, HDOP, data age, station ID,
- Accuracy (2drms probability),
- USCG's beacons for differential corrections (DGPS).

7.2. Coordinate GPS antenna position settings:
- Set GPS antenna locations from amidships and off centerline (Consistent Common Reference Point – CCRP)
- Switch on primary and secondary position sources by assigning ports for NMEA data feed

7.3. Select position system
- Primary or PS1
- Secondary or PS2
- Auto change (automatic switching to dead reckoning position).

7.4. Determine fix quality (status) of GPS:
- Position information
- Alarms and indications of disruptions of GPS data feed,
- Tracking the discrepancy between PS1 and PS2
- Monitoring the GPS data port,
- Check ship's position by a second independent means.

8. Basic navigation (1.0 hrs)

The trainee operates many of the basic navigational functions and settings (Refs: T1 ch.6.2; B7).

8.1. Activate display categories and information layers:
- Base, Standard, All and Custom
- Spot soundings limit (depths <= safe setting are displayed as bold),
- Channel limits, fairways, landmarks, special areas, warnings,
- Message “Layers Lost” when any are turned off.

8.2. Monitor vessel safety:
- Recognize position, gyro, speed log, COG, SOG, time,
- Set a safe depth value from sea level with regards to Isolated Dangers
- Set a safe depth contour
- Identify contours shown in Base Display,
- Identify other Base Display information that cannot be turned off.

8.3. Activate route monitoring features:
- Track, log, drift summary, sensor status, target tracks, scale, route information, contours, isolated dangers, special areas, alarm limits,
- Activate day/night color sets, track display, scale bar, vessel symbol,
- Set voyage recording (Logbook) track period, precision, color, history, routing info, filters.

9. Heading & drift vectors (0.5 hrs)

The trainee operates basic navigational functions and settings pertaining to ownship's heading vector, course over ground vector, and guard ring (Refs: T1 ch.8.1; R3; R4; B7).

9.1. Activate vessel’s motion vectors:
- Turn either or both vectors on or off,
- Alignment of vessel contour,
- Set vector length.

9.2. Obtain vessels’ course and speed from the positioning system:
- COG & SOG may be from position system or from ARPA reference,
- HDG is true or undefined (manual entry only when in DR),
- LOG may be bottom, water, ARPA, or position system referenced.

9.3. Interpret the movement of the vessel:
- The graphical difference between the COG/SOG and the HDG/LOG vectors is the drift angle,
- Display of drift angle reveals vessel momentum in a turn,
- Drift angle in steady state reveals sum of wind and current on vessel.

9.4. Recognize the effects of gyro error:
- Drift angle results from gyro data without any provision for correction,
- Gyro precession due to high-speed turns produces an unreliable HDG display on ECDIS.

9.5. Graphically monitor ownship’s approach to isolated dangers by means of a guard ring

EX - 1. Simulation exercise – open sea (2.5 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following task groups on ECDIS while navigating safely in an open sea setting with non-threatening ARPA targets:
  - Monitor sea area,
  - Use pre-defined route,
  - Check position with pre-defined fix,
  - Select pre-defined user layers,
  - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.

- Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
  - Set simulation parameters,
  - Brief and debrief trainees.
  - Assess accomplishment of tasks according to exercise description.

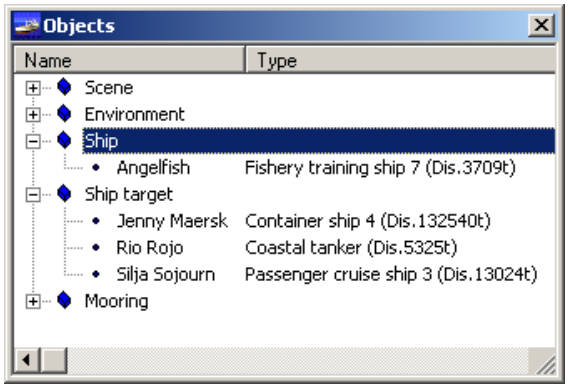
- Consider the following options in designing scenarios for Exercise 1 (for descriptions of optimal simulator arrangements, see Part A - course Framework; also App.4 and App. 5 in Appendices for the Instructor):

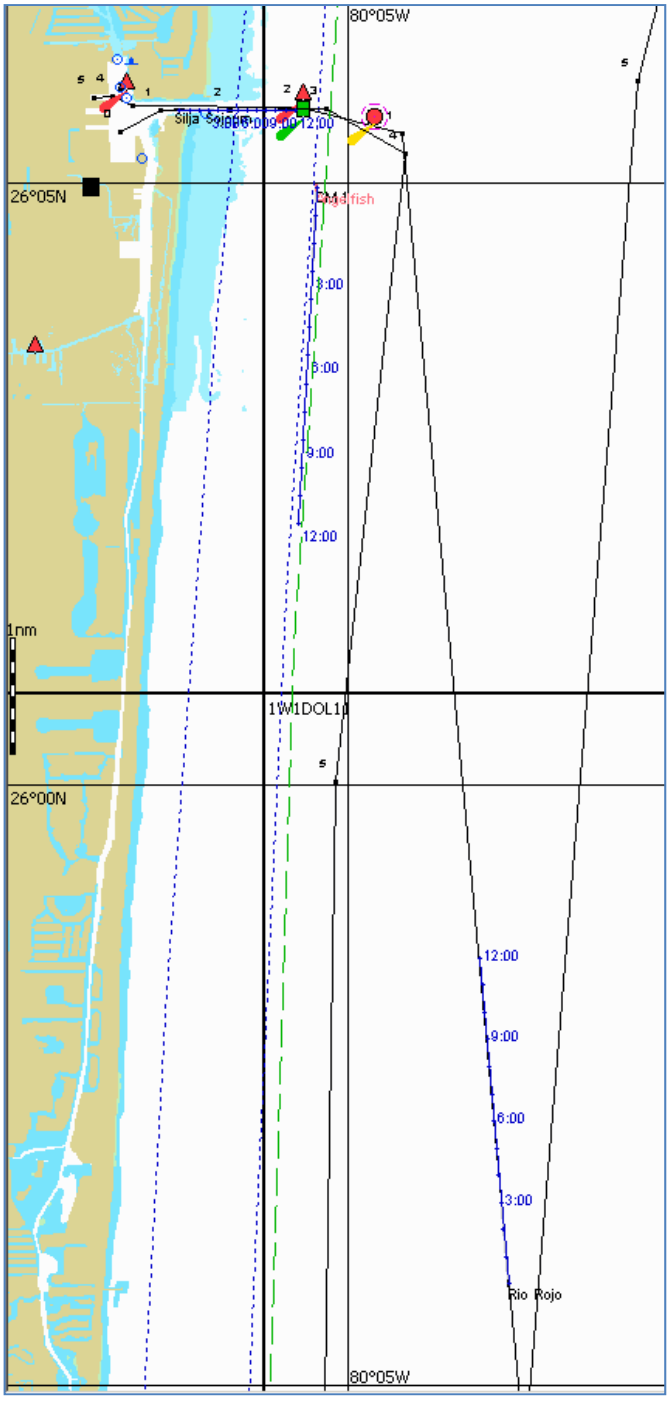
Option (A) for Exercise 1

Piloting in open waters for 1 ownship (assign 12 times simultaneously)

Task group:
- Safe navigation through skills integration

Outcomes:
- Navigate with ECDIS
- Monitor SOG & COG
- Apply standing orders: > 1 nm off land
- Stay in counter current
- 1-person watch
- Visual lookout



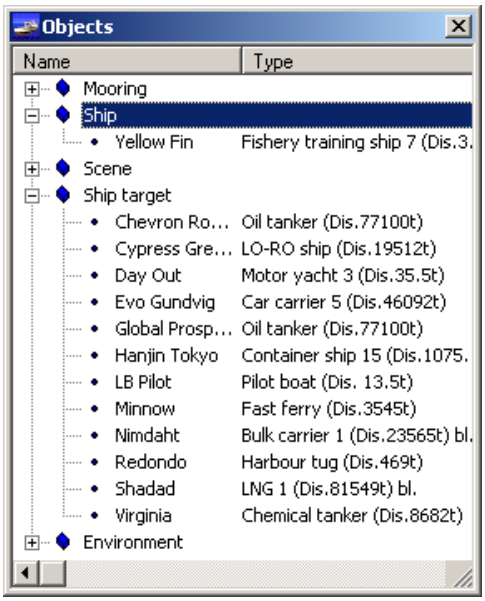


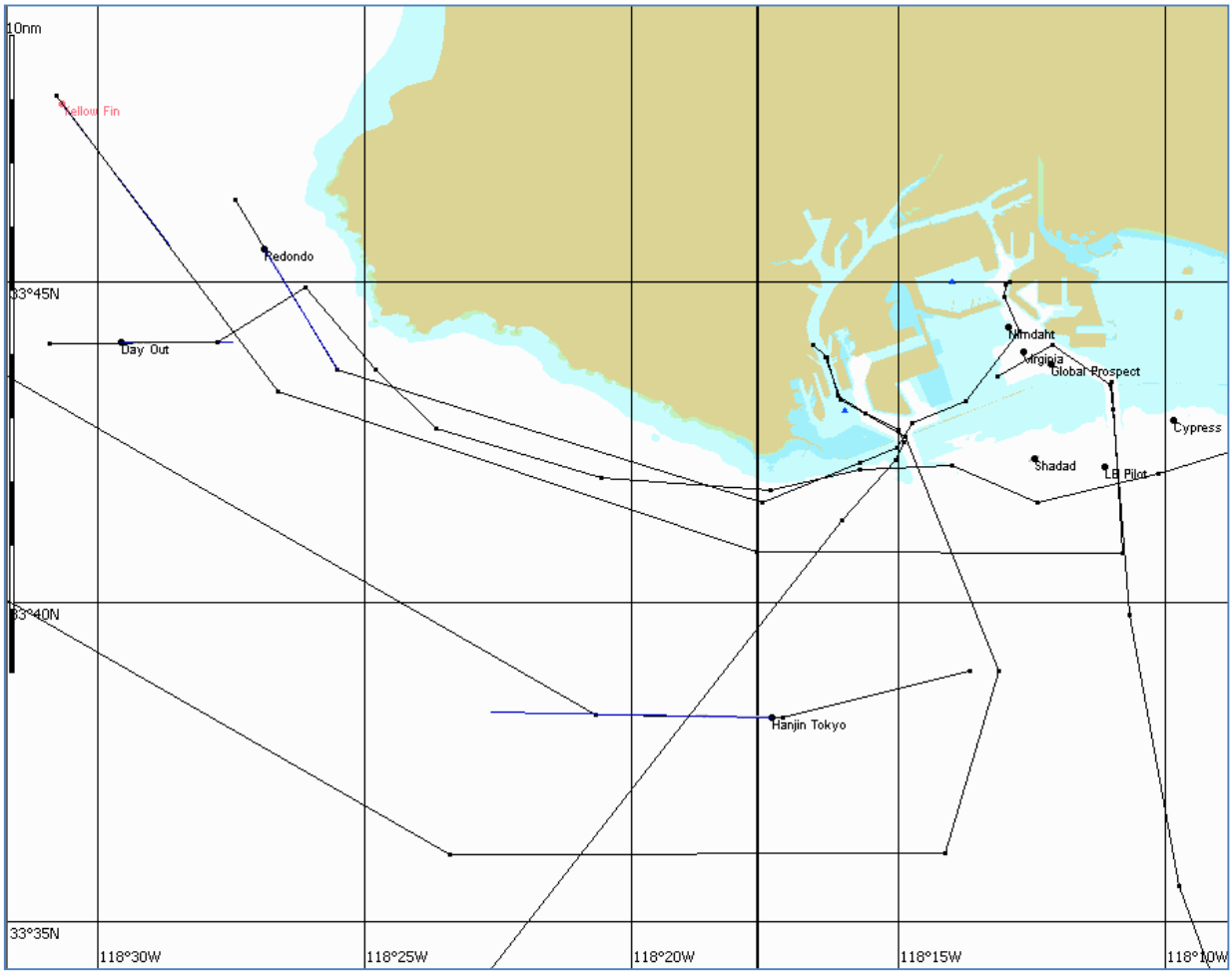
Option (B) for Exercise 1

Piloting in open waters for 1 ownship (assign 12 times simultaneously)

Task groups:
- Safe navigation through skills integration
- Adjust heading to maintain track

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Limited maneuvering





10. Understanding chart data (1.0 hr)

The trainee describes the types of electronic charts, and explains the characteristics of ECDIS data or system electronic navigational chart (SENC) (Refs: T1 ch.1 & 4; T3 ch.4 & 7.2 & 6; B5 ch.14; B7).

10.1. Define the relevant terminology of ECDIS.

10.2. Name the differences between electronic chart systems and ECDIS:
- Different ECDIS systems,
- ECDIS and ECS,
- Vector and raster charts.

10.3. Describe the various electronic chart data formats:
- Vector data,
- Raster data.

10.4. Explain the relationship between ECDIS data and the information presented on the display:
- ECDIS database and its structure,
- ENC data and the SENC,
- How manual updates are stored in the database,
- Steps and responsibilities during ENC creation.

10.5. Explain that only information stored as objects with corresponding attributes in the database is available for display.

10.6. Describe the chart data selected for display.

11. Chart quality & accuracy (0.5 hrs)

The trainee assesses all errors, inaccuracies and ambiguities in the SENC caused by improper data management (Refs: T1 ch.9; T3 ch.5; B7).

11.1. Explain what the accuracy of chart data is dependent upon:
- Accuracy of survey and all hydrographic data,
- Shifting of buoys,
- Coverage and completeness of chart data.

11.2. Explain the problems in ECDIS associated with variant datums:
- Different reference systems used for positioning (time, direction, speed),
- The effects of datum (horizontal, vertical),
- Different geodetic coordinate systems.

11.3. Assess all errors, inaccuracies and ambiguities caused by improper data management.

11.4. Explain the need and requirement that electronic chart data must be systematically updated for safe navigation.

11.5. Demonstrate issues pertaining to computer monitor display resolution:
- Potential distortions in chart scale
- The amount of information that appears on the screen
- Display adapter and the Desktop Area Setting,
- Troubleshooting display problems.

12. Chart organization (0.5 hrs)

The trainee handles ECDIS data at the workstation (this knowledge will be expanded upon and exercised in Lessons 15, 33 & 34) (Refs: T1 ch.6.3; T3 ch.10 & 7.2.2; B7).

12.1. Introduce the organization of chart data distribution:
- Explain the organization of chart data by the processes of procurement (downloading), installation (also applies to updates), selection of chart type (format), initialization, and loading (autoload by position) (reviewed again in Lesson 33)
- Demonstrate the chart data manager application associated with the type approved ECDIS,
- Describe the chart data file structure associated with the type approved ECDIS

12.2. Demonstrate the loading (retrieval) of ECDIS data:
- Automatically from the directory of available chart data for the vessel's position
- Automatically from the directory of available chart data for the cursor location
- Manually by chart (cell) name from the directory of available data

■ Lesson Plans: Watchstanding with ECDIS (8.0 hours)

13. Sensors (0.5 hours)
14. Ports & data feeds (0.5 hours)
15. Chart selection (0.5 hours)
16. Chart information (1.0 hour)
17. Changing the settings (1.0 hour)
18. Chart scaling (0.5 hours)

Ex.2 Simulator Exercise – Coastal (chart display settings) (2.0 hours)

19. Information layers (0.5 hours)
20. System & position alarms (0.5 hours)
21. Depth & contour alarms (1.0 hour)

13. Sensors (0.5 hrs)

The trainee describes the performance limits of sensors and assesses their impact on the safe use of ECDIS (Refs: T1 ch.2.16 & 6.1 & 6.5.1; T3 ch.8; B7).

13.1. Explain the performance limits of devices for position, course over ground, heading, speed, depth, radar, and AIS, especially concerning:
- Availability,
- Accuracy,
- Integrity.

13.2. Explain the need for selecting sensor data displayed in ECDIS that is appropriate and unambiguous, and accurate.

13.3. Evaluate the impairment of ECDIS when sensor performance deteriorates.

13.4. Explain and analyze various sensor alarms and indications:
- Activated when ECDIS receives no data from the external output device,
- Displayed in the second line of the Information Area as they occur,
- Use Alarm button or free cursor on 2nd-line message to disable the sound and message from the display,
- Alarm submenu function remains orange parameter returns to set limits, or when function is deliberately turned off,
- Correct response is to check the operation and connection of the relevant sensor

14. Ports & data feeds (0.5 hrs)

The trainee recognizes and selects data ports, and assesses sensor input values (Refs: T1 ch.8.2 & 8.3; B4 ch.10.4; B7).

14.1. Select between primary and secondary position source.

14.2. Observe automatic change over to secondary position source.

14.3. Explain the data reference system of each connected sensor:
- Geodetic system,
- Antenna position,
- Transducer position,
- Clock or time source

14.4. Identify the data port assigned to each connected sensor

14.5. Monitor, identify and to a limited extent decode the data stream for each attached sensor:
- Select a sensor and monitor the data stream (live or simulated),
- Generally recognize the sentence syntax associated with the sensor,
- Where possible, associate data with displayed navigational information

14.6. Assess the plausibility of sensor input values to ECDIS.

14.7. Assess the impact on displayed information when a sensor port is improperly selected.

15. Chart selection (0.5 hrs)

The trainee demonstrates manual and automatic selection of charts, and explains the potential error of the ECDIS display due to improper chart selection (Refs: T1 ch.6.4 & 9.1; T3 ch.5.3 & 7.2; B7).

15.1. Demonstrate the variety of methods that chart data can be loaded and changed (called into display)
- Automatically,
- Manually for the presently loaded route,
- Manually from the total portfolio,
- Manually displayed by the cursor position
- During the activity of the operator using the graphics cursor (further detail is provided in Lessons 23 & 24 on Route Planning and in Lesson 29 on User Charts)

15.2. Assess the inaccuracies and ambiguities caused by improper selection of a chart for display:
- When ownship position is on display, chart data list is sorted by scale
- When ownship position is not on display (viewing elsewhere), chart data list is sorted by name (alpha)
- ECDIS displays largest scale data (smallest area) on the topmost layer, but the user may prioritize by format, especially ENC to keep ECDIS in the ECDIS mode
- Automatic chart loading may be switched on or off or held to a user-selected chart (fixed)

15.3. Display updates in order to review content and to establish their inclusion in the SENC:
- Review their contents,
- Determine that they have been included in the SENC

15.4. Explain and analyze the data and chart alarms resulting from overscaling (zooming in) and underscaling (zooming out)

15.5. Explain and analyze the data and chart alarms resulting from use of a non-WGS 84 geodetic datum

16. Chart information (1.0 hr)

The trainee matches presentation to situation, and demonstrates how to get the information about the chart and chart objects (Refs: T1 ch.6.4.6; T3 ch.7.2; B7).

16.1. Select the task panel and apply the functions suitable for position monitoring, route monitoring, route creation and editing, trial maneuver, creating and accessing user layers:
- Continuous positioning while monitoring navigation,
- Trial maneuvers,
- Route planning and scheduling,
- Creating User Charts,
- Other functions

16.2. Obtain information on charted objects:
- For vector charts, use the Info button and position the acquisition marker box on the object, Navtex symbol, line, zone, free space, or chart frame corner and cycle through information window;
- For raster charts (ARCS and BSB), information is available only for the same frame size of a matching vector chart as described above

16.3. Demonstrate how the presentation of navigation marks is changed according to ownship's position

16.4. Demonstrate errors of interpretation by the incorrect selection of display categories

17. Changing the settings (1.0 hr)

The trainee demonstrates how to verify the operational settings and to assess that the navigational process is safe (Refs: T1 ch.6.3 & 8.6; T3 ch.7.6; B7).

17.1. Manually test the major functions of hardware, keyboard, mouse / trackball, sensor data, and chart data.

17.2. Check and / or select preferred operational settings in the primary task panels and on the primary information panel:
- Primary task panels
- Primary information panel
- Ship, Alarm, Chart, Logbook, ARPA;
- Configuration, Add Info (user layers), Route

17.3. Evaluate alarm and function status indications:
- Alarms, time, position update, heading and speed log;
- Route keeping, heading vectors, chart scale, track, logbook functions

17.4. Demonstrate errors of interpretation by the incorrect selection of safety values:
- Safety depth; Safety contour;
- Least depth alarm; anti-grounding alarms;
- Alarms for sailing along a route

17.5. Adjust track length and precision

17.6. Evaluate the range of information recorded in the log table (voyage recording):
- Check navigational conditions (ownship progress, charts displayed, etc.),
- Check routing events (including manual notations),
- Check system events,
- Display additional data groups

18. Chart scaling (0.5 hrs)

The trainee demonstrates the use of chart scaling and explains and avoids interpretation errors due scale (Refs: T1 ch.6.4; T3 ch.7.2.4; B7).

18.1. Demonstrate scaling of electronic chart display:
- (Scale) and select scale value,
- With chart autoload switched on, use <+> to increase scale (zoom closer), and use <–> to decrease scale (zoom out),
- (Zoom) and use cursor to draw quadrangle around area to view

18.2. Apply the automatic changing of chart scale ratio:
- Use a value from –5 to +5 to reset the scale from larger to smaller respectively from the original chart scale (0),
- Use to display electronic chart on the same scale as the original paper chart

18.3. Apply additional chart scale information:
- Horizontal screen span,
- Display of chart scale, scale bar, and bold-thin scale angle,
- Calculated range (distance) across screen display for scale in use,
- Warning messages associated with scale choice

18.4. Recognize interpretation errors due to scaling:
- Overscale of the display will spread out chart and user information with the possible loss of familiar cues for estimating distance
- Underscale of the display may cause some information to be hidden
- Underscale with SCAMIN off will result in unacceptable clutter due to data density
- Verify the selection of the appropriate scale

19. Information layers (0.5 hrs)

The trainee demonstrates understanding and proficient use of information layers (Refs: T1 ch.6.5 & 6.9 & 7.3; T3 ch.7.5.6 & 7.2.1 & 7.3.2; B7)

19.1. Observe effect on information layers and status indications when chart data is loaded and when chart area is underscaled:
- Determine native scale of chart data as it is loaded,
- Observe function of SCAMIN on and off when a chart area is underscaled (zoomed too far out)
- Observe indication of scale value

19.2. Review and apply appropriate display mode:
- Day or night presentation,
- Scale,
- Display category

19.3. Practice selecting information options in display category of “All other information”.

19.4. Differentiate between information layers, User Chart layers, and Event graphic:
- Information layers (chart display categories) and User Chart layers,
- The addition and removal of own chart entries such as manual corrections and voyage planning notes,
- The addition of Event on the display and notations made in Logbook

19.5. Respond to the indicators representing the loss of displayed information:
- Layers Lost,
- Position Dropped

EX - 2. Simulation exercise – open sea (2.0 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following task groups on ECDIS while navigating safely in an open sea setting with non-threatening ARPA targets:
  - Monitor sea area,
  - Use pre-defined route,
  - Check position with pre-defined fix,
  - Select pre-defined user layers,
  - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
  - Set simulation parameters
  - Introduce ECDIS underway score sheet for familiarization (see Part E – Evaluation and Assessment)
  - Practice remote monitoring of trainees' ECDIS use
  - Brief and debrief trainees
  - Assess accomplishment of tasks according to exercise description

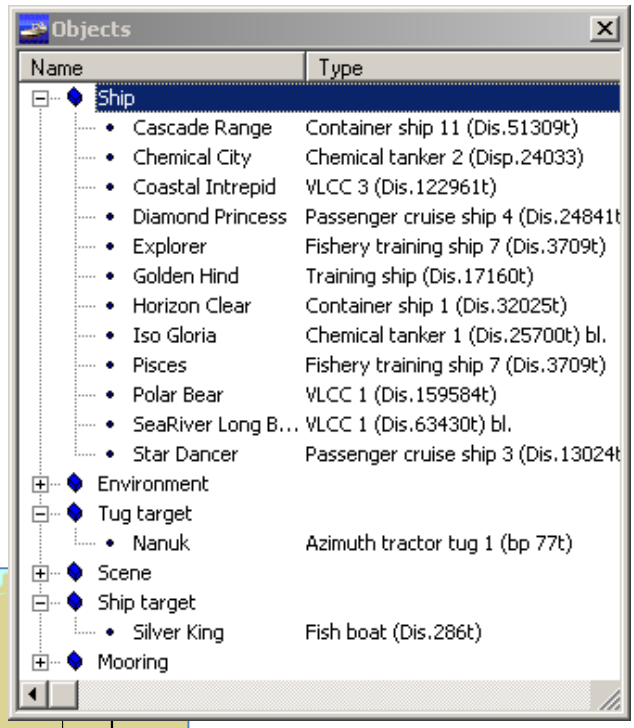
- Consider the following options in designing scenarios for Exercise 2 (for descriptions of optimal simulator arrangements, see Part A - course Framework; also App.4 and App. 5 in Appendices for the Instructor):

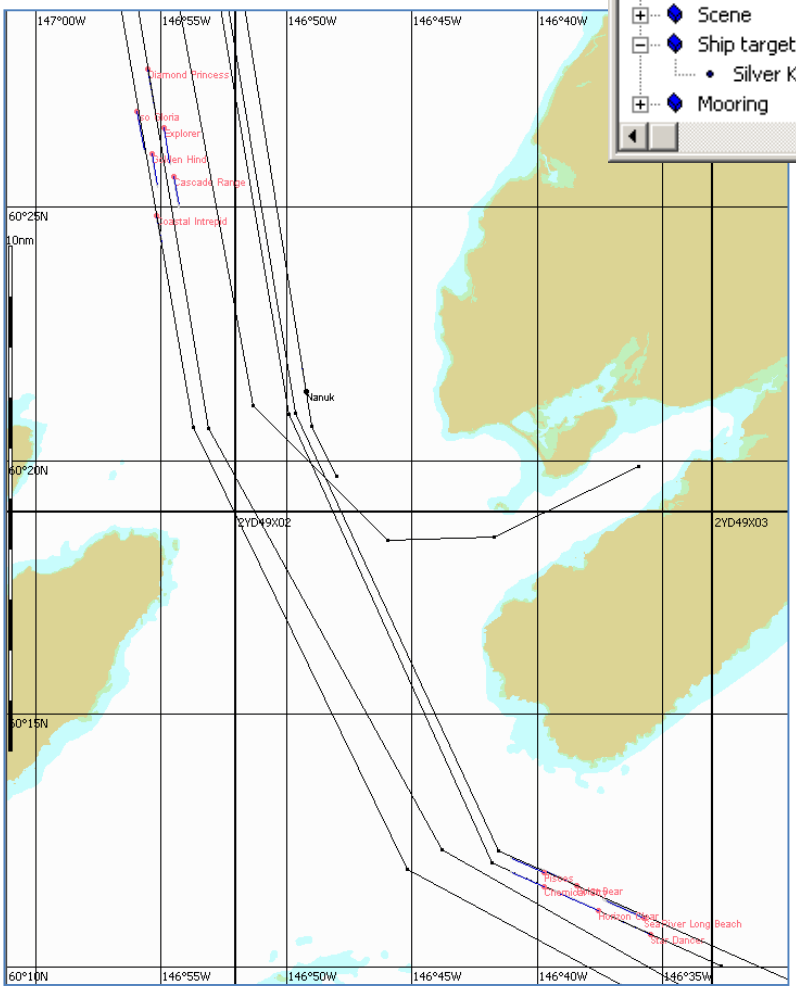
Option (A) for Exercise 2

Piloting in open waters for 12 ownships

Task groups:
- Safe navigation through skills integration
- Adjust heading to maintain track

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring



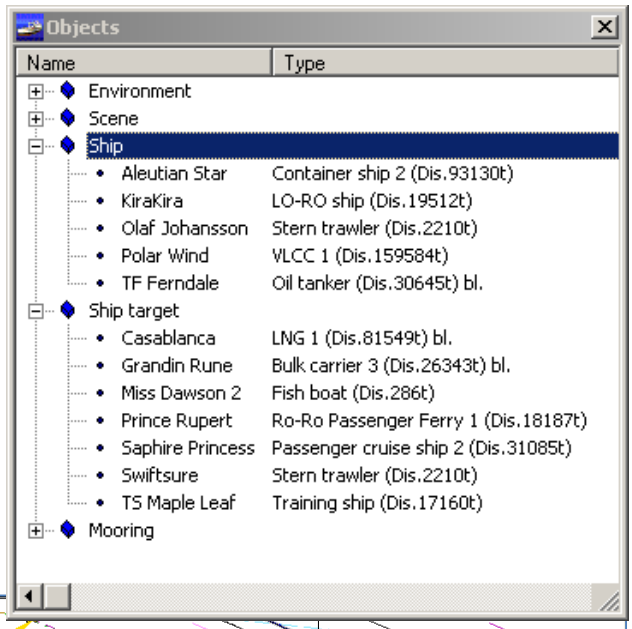


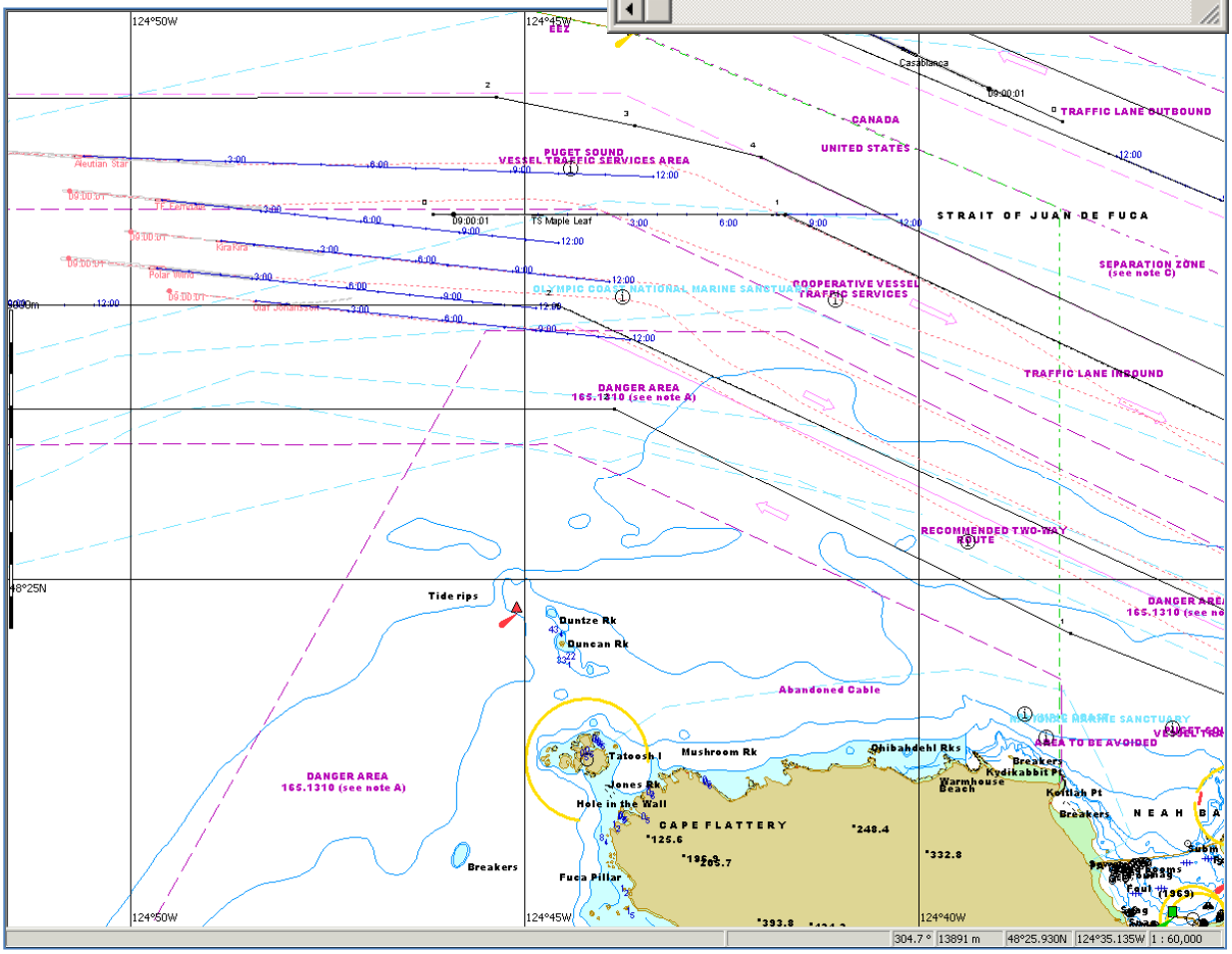
Option (B) for Exercise 2

Piloting in open waters for 5 ownships (assign 2 times simultaneously)

Task groups:
- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring



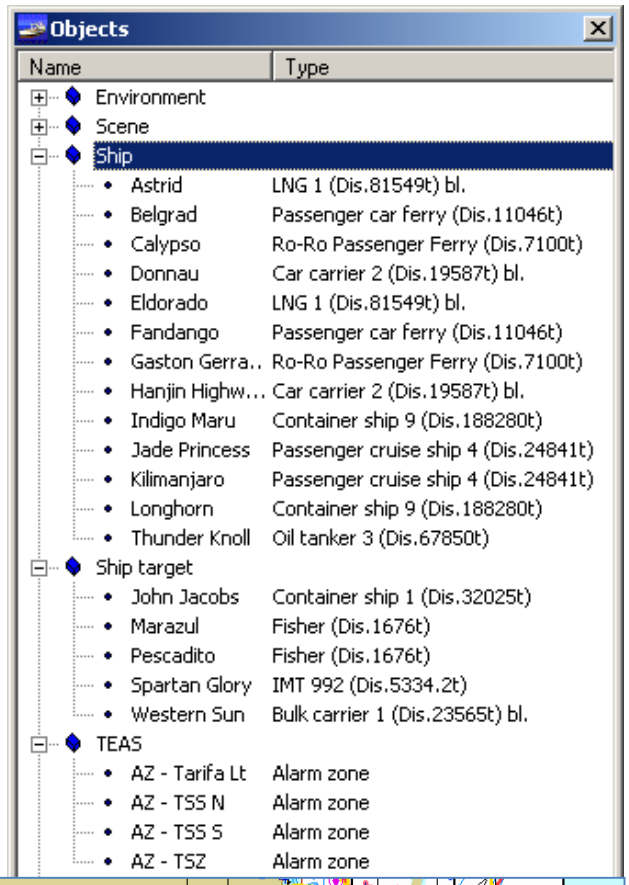


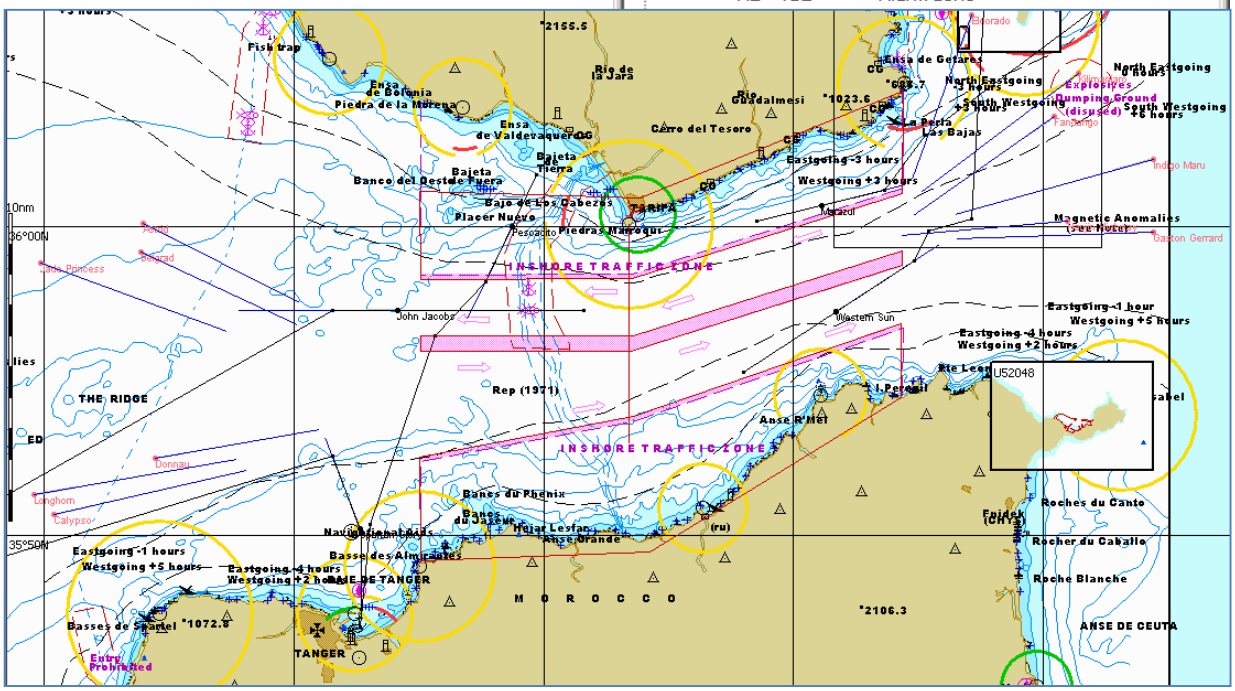
Option (C) for Exercise 2

Piloting in open waters for 13 ownships

Task groups:
- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track
- Observe TSS rules
- Alarm zones

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring


Objects
Name
Type
Environment
Scene
Ship
Astrid LNG 1 (Dis.81549t) bl.
Belgrad Passenger car ferry (Dis.11046t)
Calypso Ro-Ro Passenger Ferry (Dis.7100t)
Donnau Car carrier 2 (Dis.19587t) bl.
Eldorado LNG 1 (Dis.81549t) bl.
Fandango Passenger car ferry (Dis.11046t)
Gaston Gerra.. Ro-Ro Passenger Ferry (Dis.7100t)
Hanjin Highw... Car carrier 2 (Dis.19587t) bl.
Indigo Maru Container ship 9 (Dis.188280t)
Jade Princess Passenger cruise ship 4 (Dis.24841t)
Kilimanjaro Passenger cruise ship 4 (Dis.24841t)
Longhorn Container ship 9 (Dis.188280t)
Thunder Knoll Oil tanker 3 (Dis.67850t)
Ship target
John Jacobs Container ship 1 (Dis.32025t)
Marazul Fisher (Dis.1676t)
Pescadito Fisher (Dis.1676t)
Spartan Glory IMT 992 (Dis.5334.2t)
Western Sun Bulk carrier 1 (Dis.23565t) bl.
TEAS
AZ - Tarifa Lt Alarm zone
AZ - TSS N Alarm zone
AZ - TSS S Alarm zone
AZ - TSZ Alarm zone



20. System & position alarms (0.5 hrs)

The trainee explains the status indications and alarms pertaining to system and position, and demonstrates the proper responses (Refs: T1 ch.8.3; T3 ch.7.5.3; B7)

20.1. Identify and respond to alarms for primary and secondary positioning systems, such as:
- Primary (Secondary) Failure
- Prim. (Sec.) Diff. Mode Loss,
- Prim/Sec Pos Diverge,
- Echo Ref. Loss,
- Primary (Secondary) Data not WGS84,
- Primary (Secondary) Unreliable Position

20.2. Identify and respond to chart related alarms, such as:
- Off Chart,
- No Official Data,
- Datum Unknown,
- AG (Anti-grounding) Monitoring Off

20.3. Identify and respond to ECDIS alarms from autopilot in Track Control, such as:
- Autochange,
- Autochange restore

21. Depth & contour alarms (1.0 hr)

The trainee explains the status indications and alarms pertaining to depth and contours in route planning and monitoring, and demonstrates the proper responses (Refs: T1 ch.8.4 & 6.5; T3 ch.7.5; B7)

21.1. Describe route monitoring alarms, such as:
- Crossing a safety contour
- Prohibited or other area
- Track error allowance (XTE)
- Waypoint arrival circle
- Safety Contour changed,
- See Sounder Reading

21.2. Identify depth-related information, such as:
- Safe water depth,
- Charted obstruction,
- Depth sounder related alarms
- Depth from sounder
- Depth value of Safety Contour

21.3. Set the safety values for route monitoring:
- Safety Contour will only utilize an existing depth contour in the chart data
- Set the value for a Safety Contour to represent preferred underkeel clearance
- Set the value for Safety Depth
- Set the value for spot sounding display category

21.4. Set the limits pertaining to safe water, such as:
- Apply the ENC option of four shades
- Shallow Contour should be set to represent nothing less than ownship's deep draft
- Nav. Danger
- Depth sounder limit
- Set an advance time for approaching the set safety contour,

■ Lesson Plans: ECDIS Route Planning (7.0 hours)

22. Vessel maneuvering characteristics (0.5 hours)
23. Route planning by table (0.5 hours)
24. Route planning by chart (1.0 hour)
25. Track limits (0.5 hours)
26. Checking plan for safety (0.5 hours)
27. Embedded tide, current, wind & climate almanac (0.5 hours)
28. Route schedule (0.5 hours)
29. User charts in route planning (1.0 hour)

Ex.3 Simulator Exercise – Coastal waters (2.0 hours)

22. Vessel maneuvering characteristics (0.5 hrs)

The trainee demonstrates the use of ship's particulars in the display of route planning and maneuvering information, and explains the possible errors of interpretation (Refs: T1 ch.8.5; T3 ch.7.5 & 8.3; B7)

22.1. Select appropriate turning criteria for efficient and effective use of Autopilot in heading control mode:
- Autopilot parameters for turn radius and for turn rate govern the movement of the vessel with results viewable on ECDIS
- Maneuvers measured on ECDIS may require adjustments in the Autopilot

22.2. Correlate rudder limits in Autopilot with turning radii and rates of turn for curved track planning on ECDIS
- Turning radius for curved track planning (all waypoints),
- Maneuver data for steering to next route segment when underway using safe speed and wheel over point settings

22.3. Determine methods of alert for wheel over when approaching waypoints, such as:
- Turn radius maneuvering characteristics of ownship apply to curved track in ECDIS route planning.
- Arrival circle centered on waypoint with circumference intersecting wheel over point on ECDIS route

22.4. The navigator must verify positioning especially when ECDIS is connected to auto pilot
- Generally, only the "observed position" is controlled
- An ECDIS curved predictor may only project a momentary rate of turn, rather than sophisticated hydrodynamic calculations, and therefore have limited accuracy

23. Route planning by table (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for route planning by table (Refs: T1 ch.7.1 & 7.5; T3 ch.7.4; B7)

23.1. Retrieve a stored route plan:
- For use in route monitoring,
- For planning and review.
- Rename as working route to allow ad hoc changes while underway
- Obtain track courses and distances from list of waypoints as displayed in the table.

23.2. Approve an existing route for planning, safety review and monitoring
- Apply systematic methods of examination

- Utilize appropriate chart data intended for use along the route
- Set alarm parameters,
- Adjust cross track zones
- Scale in on charts for safety check analysis

23.3. Select the sea areas and the required waters for planning the whole passage.

23.4. Construct a route plan by inputting waypoint data alphanumerically into a route-planning table.

23.5. Adjust the route plan by editing, adding and deleting waypoints inside the table.

23.6. Review curved track planning and wheel over indication:
- Ownship maneuvering characteristics,
- Requirements of planning a safe passage including waypoint spacing

23.7. Establish procedures to name, link, rename, archive, retrieve and delete route files:
- Naming, linking and re-naming techniques for Route files
- Archiving route plans
- Deleting route plans

24. Route planning by chart (1.0 hr)

The trainee operates all specific functions and obtains all relevant information for route planning graphically by chart (Refs: T1 ch.7.2 & 7.3; T3 ch.7.4; B7)

24.1. Select the sea areas and the required waters for planning the whole passage.

24.2. Construct a route by inputting waypoints directly on the ECDIS display.
- It is advisable to rough-in the route legs at first
- Fine-tune the waypoint positions, track zones and turn radii using practical navigation considerations, such as for radar and visual navigation, traffic patterns, and ENC data quality indicators (Zone of Confidence)

24.3. Adjust the route by graphically editing waypoints.

24.4. Obtain track courses and distances from the chart:
- Cursor position,
- Selection of route segment

24.5. Obtain relevant route planning information, such as:
- Ocean wind, wave and surface current information,
- Tidal heights and currents,
- Sailing directions (port information),
- For special situations (anchoring, chart data quality, special areas, pilotage, quarantine, etc.)

25. Track limits (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for setting track limits in route planning (Refs: T1 ch.6.5.3 & 8.3; T3 ch.7.5; B7)

25.1. Review the alarm settings used as vessel is proceeding along a monitored route:
- Deviation of the current course angle as set in the planned route,
- XTE (cross track error) exceeds the value set in the route data table
- Guard vector for crossing safety contour,
- Guard vector for entering special purpose areas,

- Guard ring for crossing an isolated danger.

25.2. Modify the setting of XTE in a previously saved route:
- Re-check the route for crossing dangers of navigation according to the setting of XTE zones,
- Observe the alarm triggering while proceeding along the modified route leg
- Examine results graphically on appropriate scale chart data.

26. Checking plan for safety (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for checking a route for the presence of dangers to navigation (Refs: T1 ch.7.4 & 7.7; T3 ch.7.4; B7)

26.1. Check a previously created and saved route for crossing dangers of navigation according to the setting of cross-track distance:
- Safety contours,
- Isolated dangers,
- Limits of Special Purpose Areas.

26.2. Check the route as it is being created for dangers as listed above
- Use Safety Check while adding a waypoint and leg along a route
- Use Safety Check while modifying an existing leg or waypoint

26.3. Assess a route plan based on a safety check:
- Consider all predictable hazards along the track and assess if it is reliably safe,
- Assess which route should finally be taken,
- Assess which areas and points of the passage are critical.

27. Embedded tide, current & climate almanac (0.5 hrs)

The trainee operates specific functions pertaining tidal height, currents, and wind and wave calculations pertinent to specific situations such as route selection, anchoring and drifting (Refs: T3 ch.7.5 & 7.7 & 15.1; B7)

27.1. Determine the force and direction of the true wind:
- Observe relative wind speed and direction and ownship's heading and SOG,
- Enable display of wind vector and assess its graphic validity

27.2. Display the ocean climate wind vectors and lines of equal wave height, selected by month.

27.3. Display the dynamics of surface currents:
- Zoom out to large area view to locate surface current reference points
- Load by month.

27.4. Determine the tidal rise and tidal currents:
- At the reference station nearest to ownship position (up to 30 nm),
- At a reference station selected by name or by cursor,
- Use chart display features to predict values.

27.5. Use Current option in calculating a Route Plan Schedule.

27.6. Determine bottom type and assess anchor holding ground from information obtained on an appropriately scaled chart.

28. Route schedule (0.5 hrs)

The trainee operates all specific functions and obtains all relevant information for route scheduling (Refs: T1 ch.7.5; T3 ch.7.5 & 7.7; B7)

28.1. Observe any deviation from the route schedule setting in use as vessel is proceeding along a route

28.2. Determine expected passage times:
- Use route schedule table for proceeding along a route,
- Apply effects of surface and tidal currents in calculations,
- Calculate schedule from starting ETD and ETA's for waypoints,
- Calculate schedule from starting ETD and Log speeds for waypoints,
- Edit input data as required

28.3. Observe calculations of progress along the planned route:
- Load a route and the route schedule created for that route,
- Monitor the route
- Display route monitoring data on ECDIS information panel
- Display schedule information on ECDIS information panel

28.4. Using the ETA application in ECDIS, calculate time or speed at a selected waypoint on a monitored route:
- Speed to make good (STG) for the indicated waypoint (and display),
- Estimated time of arrival (ETA) at any waypoint

29. User charts in route planning (1.0 hr)

The trainee operates all navigational functions pertaining to own (user) chart entries and the use of planning notes (Refs: T1 ch.7.3; T3 ch.7.3; B7)

29.1. Review the ECDIS function for creating mariner's notes (User Chart)
- A User Chart is vector editor for creating added graphic and textual layers with specified attributes in the SENC
- Display of User Chart objects is superimposed (layered) on any chart data without changing it,
- There can be many User Charts maintained in the system directory, but usually only one or two displayed at a time,
- Voyage planning notes and objects called into one layer may be merged into a file called into the other layer, and resaved with or without a new name, to construct a composite file
- A User Chart may also consist of a symbol providing a link to extensive notes and hyperlinked files including photos and documents

29.2. Determine effective policy regarding User Charts:
- Purpose of particular file or chart or layer (correction, note, reference, etc.)
- Content with regard to visible data and links to data files,
- Naming with regard to purpose and geographic location,
- Value for using one or both layers (A/B) separately or simultaneously

29.3. Select User Chart for display:
- Load and unload various user charts already stored in the appropriate directory,
- Select specific information layers for display,
- Save, re-save, and re-name user charts (observe naming techniques)

29.4. Use the graphic editor for creating and modifying a User Chart:
- Add the many various types of new objects in the required position with care as pertains to use of scale,
- Edit objects and information,
- Shift objects,

- Merge user charts

29.5. Create, save and move an anchor circle guard zone as a User Chart.

- An anchor circle can include a "danger" attribute triggered by the ECDIS Consistent Common Reference Point (CCRP)
- The diameter should represent the maximum swing circle of the vessel
- The User Chart anchor circle should be positioned on the vessel's hawse pipe at the moment the anchor is let go
- Anchor Guard Zone functions provided on ECDIS (as on GPS units) generally do not reference the position of the vessel's anchor or the vessel's swing circle

•

EX - 3. Simulation exercise – coastal waters (2.0 hours)

The trainee operates specific functions constituting task groups for route monitoring in an open sea area, and obtains all relevant information for basic safe integrated navigation.

- Demonstrate the following task groups on ECDIS while navigating safely in coastal setting with non-threatening ARPA targets:
  - Monitor sea area,
  - Use route created by trainee including route schedule,
  - Select user layers created by trainee
  - Validate own ship's position by alternate means,
  - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
  - Assess environmental conditions such as tide, current, wind, waves,
  - Modify the selected route as instructed, check for safety, adjust route schedule.

Instructor guidelines

- Conduct simulation exercise according to exercise description:
  - Set simulation parameters
  - Introduce ECDIS underway score sheet for familiarization (see Part E – Evaluation and Assessment)
  - Practice remote monitoring of trainees' ECDIS use
  - Brief and debrief trainees
  - Assess accomplishment of tasks according to exercise description

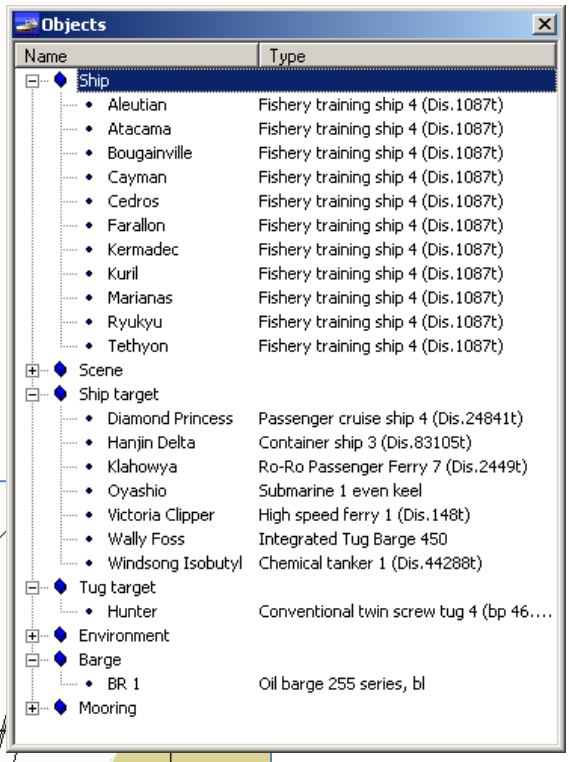
- Consider the following options in designing scenarios for Exercise 3 (for descriptions of optimal simulator arrangements, see Part A - course Framework; also App.4 and App. 5 in Appendices for the Instructor):

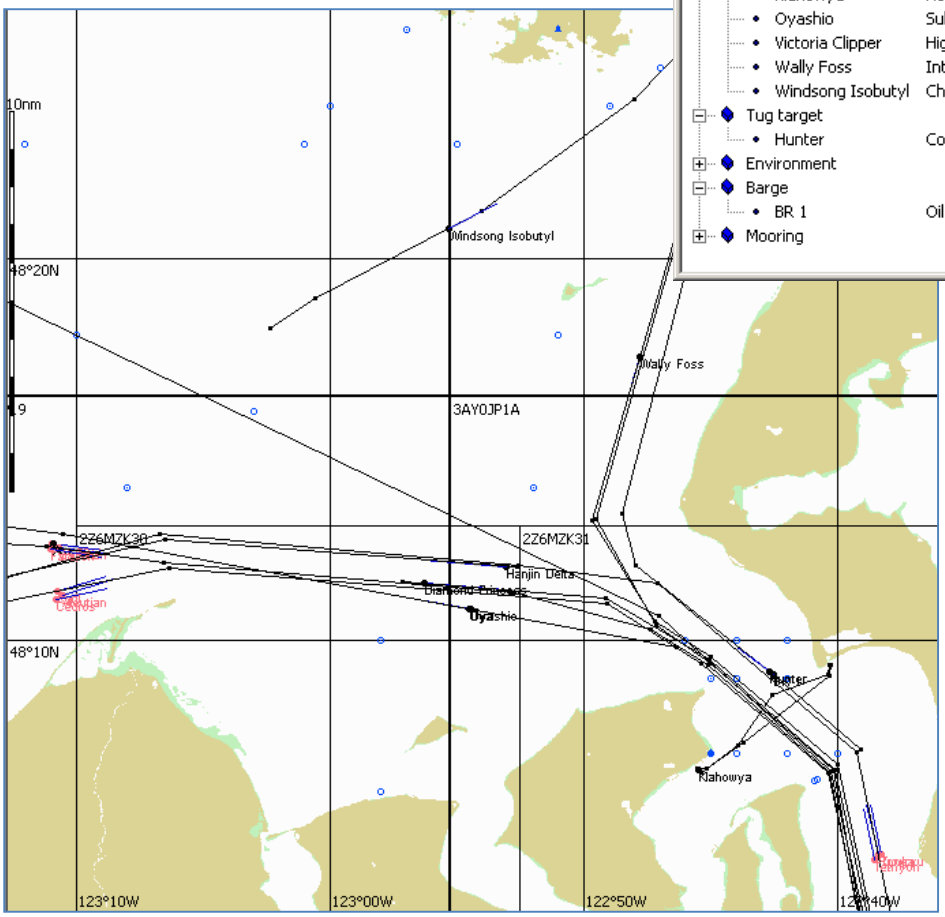
Option (A) for Exercise 3

Piloting in semi-confined waters for 12 ownships

Task groups:
- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering



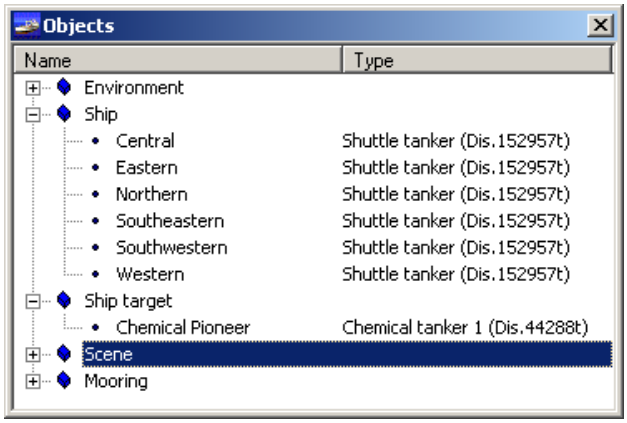


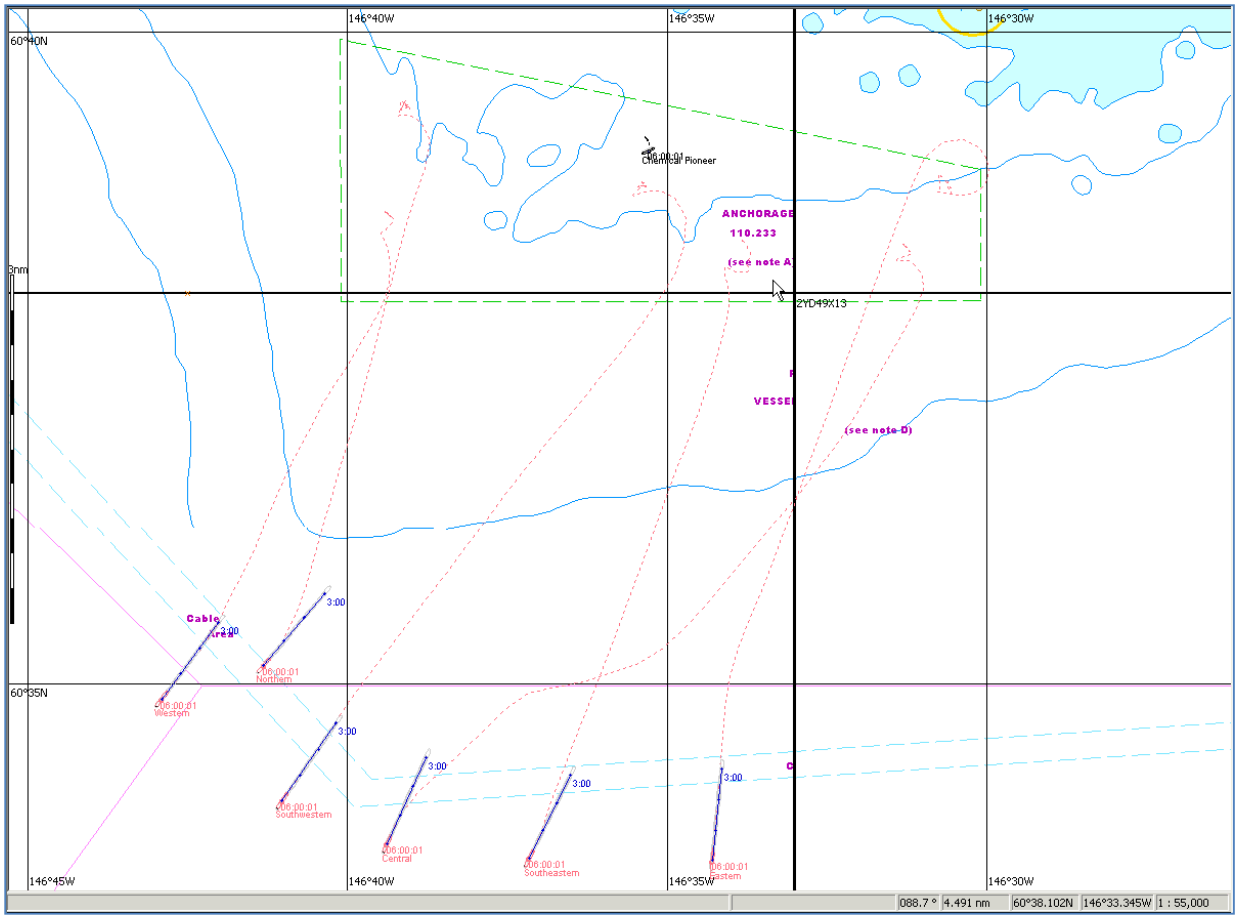
Option (B) for Exercise 3

Anchoring in semi-confined waters for 6 ownships (assign 2 times simultaneously for 12 OS)

Task groups:
- Safe navigation through skills integration
- Create and apply route
- Adjust heading to maintain track
- Observe anchorage rules
- Apply ECDIS user layer for anchoring

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering





■ Lesson Plans: ECDIS Targets, Charts & System (8.5 hours)

30. ARPA tracked target overlay (0.5 hours)
31. AIS functions (0.5 hours)
32. Radar overlay functions (0.5 hours)
33. Procuring & installing chart data (1.0 hour)
34. Installing charts data (1.0 hour)

Ex.4 Simulator Exercise – Coastal & Confined (advanced integrated navigation with ECDIS) (2.5 hours)

35. System reset & backup (0.5 hours)
36. Archiving with ECDIS data management utility (0.5 hours)
37. Data logging and logbook (voyage recording) (1.0 hour)
38. Playback (0.5 hours)

30. ARPA tracked target overlay (0.5 hrs)

The trainee demonstrates the use of ARPA operations in ECDIS (Refs: T1 ch.8.4.3; T3 ch.8.2.3 & 8.5; B7)

30.1. Examine sensor setup requirements for ARPA tracked targets:
- The identity of associated com port(s) and baud rate matched to ARPA output
- Correct location of sensor reference (Consistent Common Reference Point)

30.2. Determine speed and heading inputs used in ARPA tracked target data calculations

30.3. Access target info display:
- Cursor (mouse over)
- Target table, with sorting options for data fields
- Target name field in table may provide direct display link on chart

30.4. Interpret target symbol features:
- Identify by number from ARPA-A or ARPA-B, or by writing an alias into target table
- Vector and green circle at radar-determined position
- Alarm can be set when both CPA and TCPA approach limitations are exceeded
- Vector length the same as set for ownship
- Target tracks are saved in daily files, and selectable for viewing on display

31. AIS functions (0.5 hrs)

The trainee demonstrates the use of Automatic Identification Systems in ECDIS (Refs: T1 ch.8.4.5 & 6.9; T3 ch.8.4; B4 ch.10.3; B7)

31.1. Describe what the connection of an Automatic Identification System (AIS) to ECDIS enables:
- Receiving identification and navigation information on other targets transmitting on AIS,
- Analysis of target's motion over ground
- Potential control from ECDIS of ownship's Static and Voyage data
- Data string consists of considerable amount of encapsulated data,
- Data string is transmitted by VHF data link (VDL) with typical line of sight range limitations

31.2. Examine sensor setup requirements for AIS targets:
- Identity of associated com port(s) and baud rate matched to AIS interface
- Correct location of sensor reference (Consistent Common Reference Point)

31.3. Determine alarms and other settings for AIS targets:
- Alarms and other settings for AIS targets are set in ECDIS target panel
- CPA & TCPA calculations on AIS targets are derived from ECDIS speed and heading inputs

31.4. Access target info display options:
- Cursor (mouse over)
- Target table, with sorting options for data fields
- Target name field in table may provide direct display link on chart

31.5. Interpret AIS target symbol features:
- Position of symbol represents the target's transmitted (D)GPS antenna position
- An AIS target is displayed graphically as a green isosceles triangle with heading of vessel (if transmitted), including flag showing direction of turn
- Additional vector from ECDIS calculation of COG, with length the same as set for ownship
- Divergence of COG/SOG vector from heading indicator represents target's drift angle
- Target is processed for collision avoidance by the ECDIS on the same principles as tracked targets
- Identifier is MMSI number until static info is established then name and call sign can be displayed (by writing an Alias into Table)
- ARPA tracking on ECDIS can be correlated with an existing AIS target
- Alarm can be set when both CPA and TCPA approach limitations are exceeded
- Target tracks are saved in daily files, and selectable for viewing on display

32. Radar overlay (RIB) functions (0.5 hrs)

The trainee explains the display of radar signal input, and demonstrates the use of radar image in ECDIS (Refs: T1 ch.8.4.4; T3 ch.8.2.1 & 8.2.2 & 11.1.5; B7)

32.1. Describe the technical function of the radar integrator board (RIB) hardware
- The RIB functions by means of a hardware module which receives from radar an analog video signal and the digital processing of that signal,
- RIB gain, filters, scaling, and target tracking function independently of the radar transceiver delivering the raw video and trigger
- Is displayed in the SENC as a layer over chart data
- RIB functions on ECDIS permit the continuous recording in the ECDIS PC of the radar picture and motion of tracked targets

32.2. Examine the main functions of the radar integrator board
- Require sensor setups and involve numerous interfaces on the ECDIS task panel
- Radar signal input,
- Radar target selection,
- Formation of a radar image,
- Target functions
- Radar operation functions independent from radar transceiver

32.3. Operate the user interface controls for radar overlay
- Target tracking
- Image recording
- The overlay image can be removed from the display by a single interface option

32.4. Demonstrate sources of image offset
- A mismatch can develop between chart and radar data
- Sensor position setup,
- Input of radar data (such as from transceiver problems)heading misalignment,
- Position sensor error,
- Uncharted and/or incorrectly charted objects, and chart datum error

32.5. Determine source of ECDIS-tracked target data calculations
- ECDIS speed and heading inputs are used in ECDIS-tracked target data calculations
- Radar motion vector may be through the water rather than over ground
- CPA & TCPA are derived from the ECDIS independently from the radar

33. Procuring & installing chart data (1.0 hr)

The trainee installs chart license software and chart data of various formats (Refs: T1 ch.4.4; T3 ch.9.2 & 9.3 & 9.4; B7)

33.1. Review chart data structure, terminology, and installation procedures:
- SENC, and various formats
- DNC format corresponds with American MIL-STD-2407 standards, which are based on the "Feature/Attribute Coding Catalogue (FACC)" normative document.
- The operator procures, installs / updates, selects; the ECDIS unit initializes, loads (introduced in Lesson 12)

33.2. Review chart format requirements for ECDIS:
- ECDIS requires the use of charts in official formats issued by the properly authorized government hydrographic offices.
- These are currently S 57 specified ENC's (manufactured by the respective regional Hydrographic Offices); S-101 ENC product specification is currently being developed; S-100 IHO universal hydrographic data model has been developed recently to enable the easier integration of hydrographic data and applications into geospatial solutions, and will eventually replace S-57

33.3. Examine data distribution sources for ENC
- Regional/global coordinating centers (RENC) such as Primar (hosted by the Norwegian HO) and IC-ENC (hosted by the UKHO) are engaged in the distribution of ENC data.
- These centers accumulate chart databases from participating hydrographic offices, ensure quality standards are met, and provide the data to distributers for procurement by end users.

33.4. Examine data distribution sources for SENC conversions
- The S 57/ENCs distributed by a SENC service from ENC providers Primar, IC-ENC and NOAA have been converted to CD8 SENC format for simplified installation and updating.
- The process of converting S-57 (ENC) format charts to SENC format is subject to DNV and IHO requirements.

33.5. Examine license structure for various formats, and practice installation
- License / permit structure depends on the chart data format
- License / permit installation generally occurs through the chart data management utility associated with the ECDIS:
  - Proprietary / private vector format may install directly from data file
  - ENC chart data in DX-90 format installs from ENC_ROOT folder using chart management utility
  - BSB raster chart data installs from BSB_ROOT folder using chart management utility
  - US military data in VPF format (DNC) requires chart management utility
  - Admiralty Raster Chart format (ARCS) requires chart management utility

33.6. Extract information on installation history
- Installation history is retained during installation
- History includes the addition and deletion of individual charts/cells
- History file is generally accessible through the chart data management utility associated with the ECDIS

34. Installing chart corrections (1.0 hr)

The trainee applies manual and automatic updates (corrections) to electronic charts, and assesses the importance of updating (Refs: T1 ch.4.5 & 6.3; T3 ch.10; B7)

34.1. Explain why electronic chart data is maintained with up-to-date corrections:
- The safety of navigation requires data that is maintained with up-to-date corrections
- The responsibility of seaworthiness as defined by SOLAS requires charts for the intended voyage that are up to date

34.2. Add or modify a chart object using Manual Correction task:
- Using the Manual Correction task in ECDIS, a chart object layer may be added or modified
- The manual correction may include attributes and links, may be concealed, may be made time-active, and may be deleted

34.3. Examine production license options for accessibility of automatic updates:
- Chart data licensing options may include services for automatic updating
- Sometimes referred to as maintenance in reference to proprietary chart data

34.4. Install various automatic update formats using various methods
- Using chart managing utility associated with the ECDIS program, install the following depending on availability:
  - Procured or downloaded update files for proprietary chart data
  - Procured or downloaded ENC updates
  - Downloaded DNC update patch files
  - Procured or downloaded BSB and NDI raster update patch files
  - Procured or downloaded ARCS update patch files

34.5. Extract information on update history
- Installation history is retained during updating
- History includes the addition and deletion of individual charts/cells
- History file is generally accessible through the chart data management utility associated with the ECDIS

EX – 4. Simulation exercise – confined waters (2.0 hours)

The trainee obtains all relevant information for safe navigation and operates specific functions for collision avoidance while route monitoring in confined waters

- Demonstrate the following task groups on ECDIS while navigating safely in a confined waters setting with threatening targets in specified waters:
  - Monitor sea area,
  - Use route created by trainee including route schedule,
  - Select user layers created by trainee
  - Validate own ship's position by alternate means,
  - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
  - Use ECDIS features to assess target threats and execute course and/or speed alterations to avoid collision (or advise conn if working in 2-person team in SAR exercise, where ECDIS operator is advising the conn)
  - Comply with COLREGS
  - Comply with bridge procedures established by trainee and/or instructor

Instructor guidelines

- Conduct simulation exercise according to exercise description:
  - Set simulation parameters
  - In SAR exercise (Option A), consider assigning 2 trainees per ownship, where one is the ECDIS operator and the other makes conning decisions
  - Sharing of ECDIS route can be accomplished copying a route file into the source folder on the other ECDIS units
  - Conduct practice grading on ECDIS underway score sheet for (see Part E – Evaluation and Assessment)
  - Practice remote monitoring of trainees' ECDIS use
  - Brief and debrief trainees
  - Assess accomplishment of tasks according to exercise description

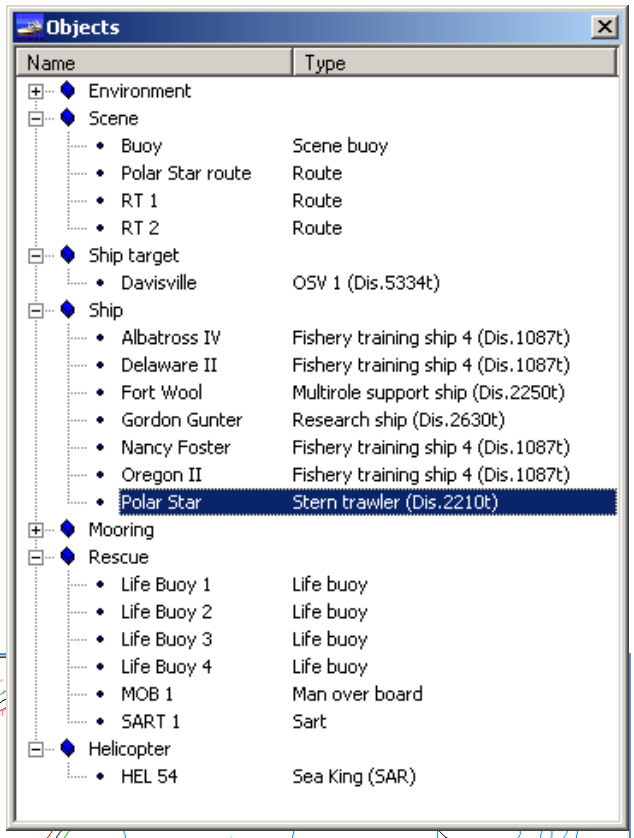
- Consider the following options in designing scenarios for Exercise 4 (for descriptions of optimal simulator arrangements, see Part A - course Framework; also App.4 and App. 5 in Appendices for the Instructor):

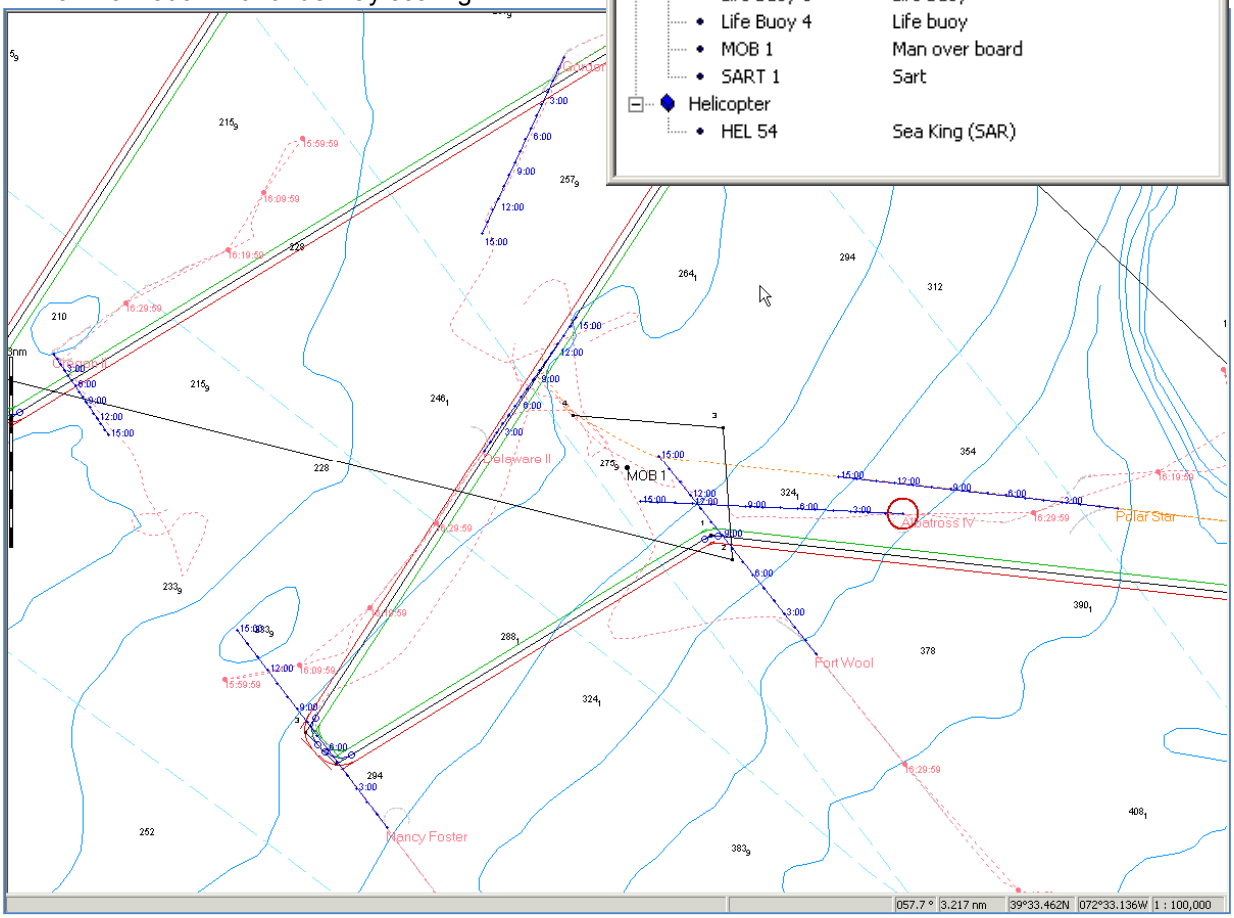
Option (A) for Exercise 4

Piloting in open but congested waters for 6 ownships

Task groups:
- Safe navigation through skills integration
- Adapt ECDIS route to SAR (on-scene command vessel creates route, other vessels retrieve and apply that route)
- Adjust heading to maintain track
- Find MOB

Outcomes:
- Share ECDIS route
- 1 or 2-person watch
- Cooperative navigation
- Team & communications
- Visual lookout
- Maneuvering
- Familiarization with underway scoring



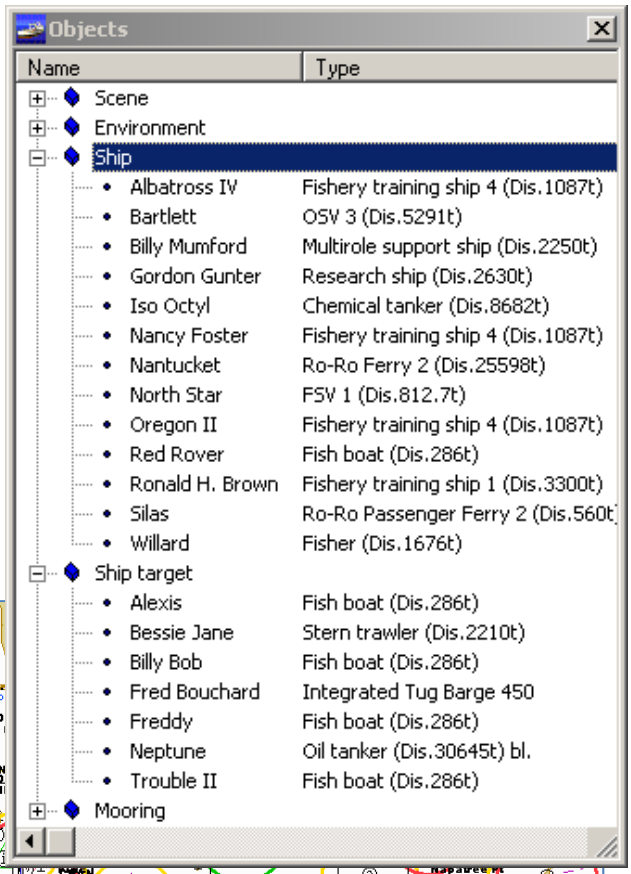


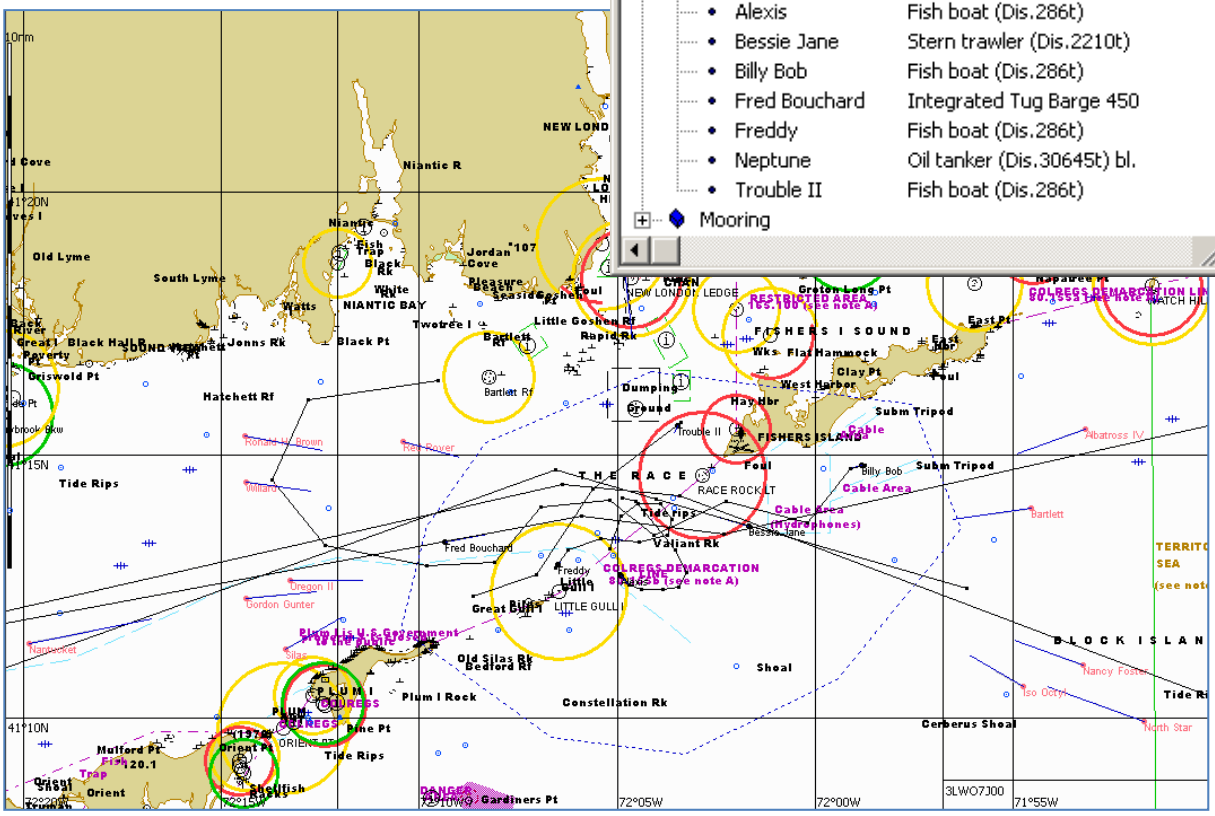
Option (B) for Exercise 4

Piloting in confined waters for 13 ownships

Task groups:
- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload
- Create and apply route
- Adjust heading to maintain track

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring



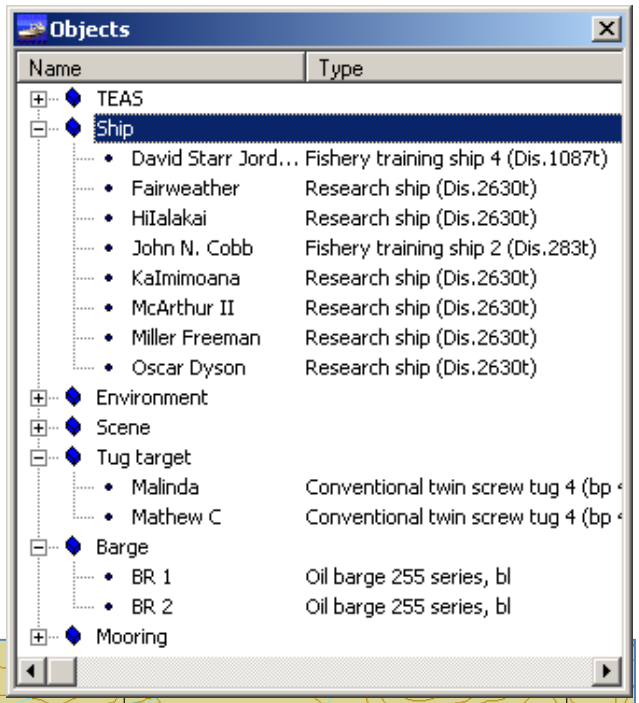


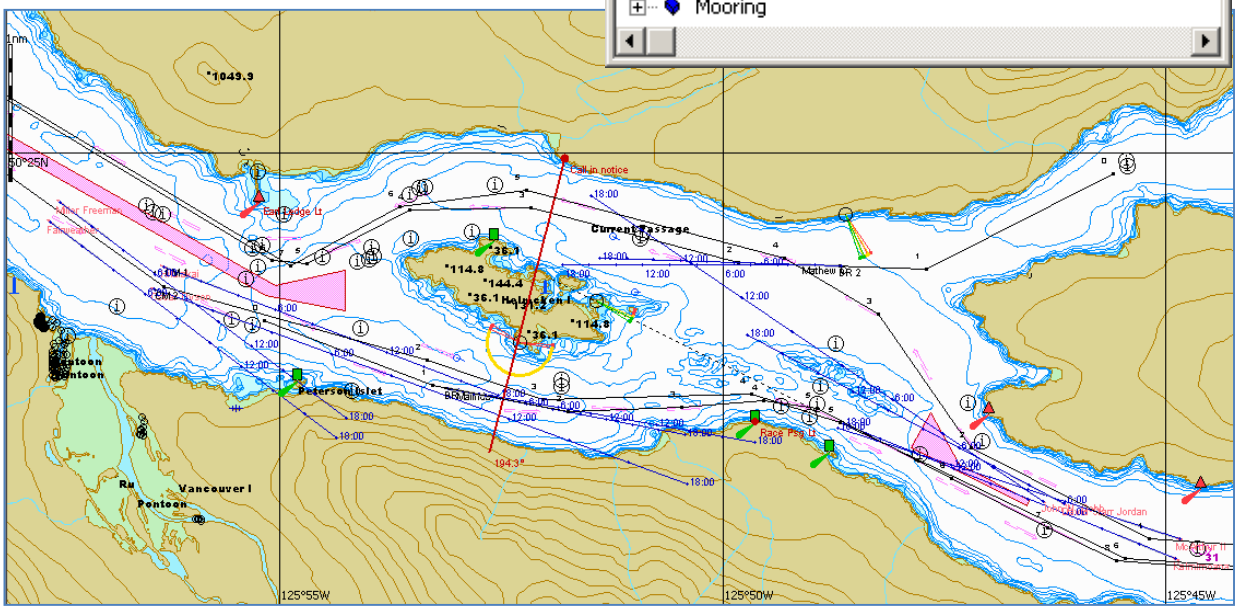
Option (C) for Exercise 4

Piloting in confined waters for 8 ownships

Task groups:
- Safe navigation through skills integration
- Adapt instruments to conditions
- Create and apply route
- Adapt track-keeping to workload
- Adjust heading to maintain track
- Observe TSS rules
- Alarm zones

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- Familiarization with underway scoring





35. System reset & backup (0.5 hrs)

The trainee performs basic troubleshooting and uses the back-up system in the case of ECDIS failure (Refs: T1 ch.8.7 & 8.8; T3 ch.11.3 & 11.4; B7)

35.1. Explain the intent of regulations on ECDIS back-up arrangements
- The regulations on ECDIS back-up arrangements intend that backup is ensured through electronic and/or paper chart options
- The installation of a duplicate set of ECDIS equipment combined in a single computer network where each ECDIS PC is connected to the navigational sensors and assigned “Master” or “Slave” status, guarantees interchangeability without loss of data in case of failure of one of the systems
- The availability of an updated paper chart collection is required where a single set of ECDIS equipment is installed (standalone), or when ENC coverage for the intended route is unavailable, such as when raster or proprietary chart data is provided instead of ENC data
- The purpose of the backup arrangement is to preserve the safety of navigation in the event of degradation or loss of the ECDIS as the primary means of navigation

35.2. Perform back-up procedures in standalone ECDIS failure event:
- Charts include the planned route
- Regular plotting of ship’s position when navigating within restricted waters

35.3. Perform networked back-up procedures in (Master) ECDIS failure event:
- Includes prior equalizing of route, chart data and user data

35.4. Perform troubleshooting routines in ECDIS, such as for:
- Damaged initialization and configuration files,
- Integrity of cables and com ports integrity,
- Sensor assignment and configuration

35.5. Recognize consequences to navigation safety while troubleshooting:
- Includes track display, autopilot functions and other systems deriving data feed from ECDIS

35.6. Recognize consequences to data storage while ECDIS PC is down:
- Despite continuous functioning of sensors, the consequence while ECDIS PC is down is that all data storage ceases.
- There will be a gap graphically on the display upon restoration of ECDIS PC and a corresponding gap in electronic logbook data

36. Archiving with ECDIS data management utility (0.5 hrs)

The trainee stores and retrieves files on the same workstation and transfers certain files between workstations (Refs: B7)

36.1. Use ECDIS data management utility to work with files associated with ECDIS operations:
- Select many groups of navigational data files (logbook, ownship tracks, target tracks, user charts, routes, ship model, system log, S57 log)
- Convert from binary to text (can be subsequently opened in word processing programs for formatting, printing or archiving)
- Convert formats
- View and print various converted data files directly within utility

36.2. Use ECDIS data management utility to transfer select data files between storage media:
- Recognize ECDIS directory structure for file retrieval and storage
- Recognize which files can be copied or moved to other directories or drives
- Copying files into the ECDIS program via Data Tool

- Would normally be done only for user layer files and route plan files created in another ECDIS installation (such as on another vessel),
- Requires familiarity with the directory structure in ECDIS,
- Copying and moving files is easily done with standard PC methods, but conversions in and out of binary or text requires the ECDIS data management utility

37. Data logging and logbook(1.0 hr)

The trainee explains the meaning of voyage recording (Refs: T1 ch.8.6; T3 ch.7.6 & 13.9; B7)

37.1. Examine requirements and functions of logbook task in ECDIS, such as:

- Voyage recording consists of 24-hour data files, changing dates at GMT midnight
- A complete status check of all alarm functions and many setup conditions upon date change
- Collection of all fields upon:
  - Waypoint and Watch change (basic),
  - Manually triggered Event,
  - Screen coordinates change due to display reset (true and relative motion) and scale change
  - Change in chart data displayed
  - Change in alarm status and condition
- Chart data field includes displayed chart number (if ENC, also source, edition, date and cell)
- Does not include Route or Route Schedule used in monitoring

37.2. Examine display functions of ownship track and tracks of AIS, ARPA and RIB targets:

- Includes position and heading data up to every second, but possibly less frequent depending on the ECDIS and its settings
- Ownship track history from alternate date may be displayed instead of current date - creating ambiguity if unintentional
- No matter what track date is displayed, current track for six minutes will be displayed
- Targets tracked on ARPA, radar overlay and AIS (as connected sensors) will be included in track file

37.3. Perform various hard copy print outs, such as:

- Direct from ECDIS logbook task
- Direct from ECDIS route planning and route schedule task
- Screen capture of display, including chart area and information panels

38. Playback (0.5 hrs)

The trainee operates the functions pertaining to voyage recording, specifically the reconstruction and playback of selected situations (Refs: T3 ch.7.6; B7)

38.1. Explain the disruption of ECDIS when operating Playback utility

- Operating Playback utility runs all normal ECDIS functions but also bypasses all inputs,
- Results in the complete disruption of all route monitoring and data logging

38.2. Explain that no route or route plan is securely associated with any playback

- No route or route plan is securely associated with any playback; there will be no indication of any route plan(s) in the track files
- However, during playback, normal recording of Waypoint approaches in logbook can aid in determining the route in use

38.3. Explain that no chart data is securely associated with any playback

- No chart data is securely associated with any playback; there may be no record of chart formats enable or disabled in system setup
- However, during playback, the chart data displayed is captured in logbook with every entry

- Chart data available at the time of the selected track file can only be deduced by reviewing chart installation and update history file

38.4. Perform a playback of an event or passage specified by date and time
- Select a previous exercise or real vessel track file for review
- In Playback utility, select date for file to observe, start then pause, then advance to desired time by moving cursor
- Observe the construction of the past track, including tracked target data through targets task

38.5. Closely observe the position and heading update interval in Playback
- During playback, analyze the updating interval for position and heading

38.6. During playback, analyze the logbook for the quality of navigation:
- Alarms and responses
- Chart data in use
- Operational settings in use

■ Lesson Plans: ECDIS Responsibility & Assessment (6.0 hours)

39. Responsibility (1.5 hours)
40. Effective navigation with ECDIS (1.0 hour)

Ev. - 1 Written evaluation (1.0 hour)

Ev. – 2 Simulation evaluation – coastal & confined waters (2.5 hrs)

39. Responsibility (1.5 hrs)

The trainee describes the essential legal aspects and responsibilities in the use of ECDIS (Refs: R1; R3; R5; R6; R7; T1 ch.5; T3 ch.13.4)

39.1. Re-examine COLREGS – implicit
- There is no specific mention of ECDIS (or position fixing or AIS) in the COLREGS, yet.
- However, ECDIS use is implied in the phrase “all available means” (Lookout (5), Risk of Collision (7)) occurring in Conduct of Vessels in Any Condition of Visibility - Rules 4-10

39.2. Re-examine SOLAS, as amended – explicit
- Operating ECS and ECDIS without complete or updated chart data has been considered a contributing factor in several recent casualties. SOLAS V/2, V/19 & V/27 regulations address:
  - The carriage of charts
  - The equivalency of ENC format vector charts and paper charts
  - The non-equivalency of any other format
- SOLAS V/19 was amended in 6/09 to require ECDIS (see MSC.282(86))

39.3. Re-examine IMO approval of equipment and installations
- Equipment and installations are specified in IEC 61174 ed. 3.0, ECDIS operational and performance requirements, methods of testing and required test results [for purchase];
- Other references to installations include:
  - IMO's revised ECDIS Performance Standards, MSC.232(82);
  - See also SN.1/Circ.266/Rev.1 (12/ 2010) on ECDIS software maintenance;
  - See also SN.1/Circ.265 (10/2007) on bridge design

39.4. Re-examine IMO carriage requirements
- SOLAS ch. V Reg. 19.2.10 and 19.2.11 as amended by resolution Annex 1 of MSC 86/26), adopted 6/2009, (also MSC.282(86)) makes the carriage of ECDIS mandatory in a phase-in

schedule from 7/2012 through7/2018. See also details from the recent International ECDIS Conference, (Singapore, 10/09).
- For the run-up to this development, the following are explanatory. The NAV subcommittee 53rd session (7/07) extensively debated the pros and cons of an ECDIS carriage requirement; see also DNV article advocating carriage (5/07) and DNV Technical Report No. 2008-0048

39.5. Re-examine national ECDIS carriage regulations
- For US regulations for charts carriage, and permissibility of ECDIS on SOLAS vessels (on international voyages) see 33CFR164.33(a)(1) & 67 FR 53383, 8/15/02 [USCG-2002-13057], as extended 69 FR 42192, 7/14/04

39.6. Re-examine STCW Code, as amended
- International ECDIS training requirements are now included in STCW 2010 Part A (Code) through the Manila Amendments of 6/2010, effective 1/2012 with a 5-year grace period.
- The basic STCW competence requires maintaining the safety of navigation using ECDIS, with differences in application between junior and senior deck officers:
  - Table A-II/1, Navigation at the operational level, ≥500 GT
  - Table A-II/2, Navigation at the management level, ≥500 GT
  - Table A-II/3, Navigation at the operational level, <500 GT

39.7. Re-examine flag state (maritime) implementation
- In the U.S., NVIC 02-03 Carriage of Navigation Equipment by Ships on International Voyages outlines the interim acceptance for meeting SOLAS carriage requirements regarding the use of ECDIS for primary means of navigation on board foreign vessels in U.S. waters.
- NVIC 02-03 is considered temporary guidance until U.S. navigation regulations are formally amended to also include U.S registered vessels. (See also IEC doc on ECDIS, Section 2.12.)

39.8. Re-examine IMO training Guidance (and providing review of course)
- A detailed outline for training and assessment in the operational use of ECDIS is now included in the STCW 2010 Manila Amendments, Part B: Guidance, but is not to be regarded as required or enforceable;
- See also SN.1/Circ.207/Rev.1 “Differences between RCDS and ECDIS”;
- This Revised Model Course 1.27 (2010 edition), will provide national authorities with a detailed training course for guidance in assessment and certification in the primary STCW competence regarding ECDIS: Maintain the safety of navigation through the use of ECDIS

39.9. Re-examine ISM requirements of ship owners & operators
- Under the terms of the ISM Code (International Ship Management Code), the ship owner or operator has a responsibility to ensure that personnel are given proper familiarization with their duties.
- If a ship is equipped with a compliant ECDIS as the primary means of navigation at sea, the ship owner has to provide ECDIS training to ensure that ECDIS users are both properly trained and familiar with the shipboard equipment before it is used. Future impacts on insurance and liability are possible. (See also IEC doc on ECDIS, Section 3.3)

40. Effective navigation with ECDIS (1.0 hr)

The trainee describes how ECDIS is used effectively in navigation (Refs: T1 ch.10.2; T3 ch.7.3 & 8.1 & 11.2 & 16)

40.1. Describe bridge functions incorporating ECDIS
- ECDIS can be used in support of many important bridge functions, but such support requires its own skill and knowledge facility, and constitutes an additional bridge function:
  - Visual monitoring – effective lookout, verify visual contact
  - Planning – charts, updates, routes, weather forecasts, weather routing

- Piloting – course changes, dead reckoning, vessel position, radar overlay, position history, alarm history
- Maneuvers – conditions (wind, tide, current, ice, climate data), vessel characteristics, docking, anchoring, lightering, canal transit
- Traffic – collision threat analysis, target data (ARPA, AIS, overlay tracking), verify ARPA target presentation, trial maneuver, COLREGS application, track history
- At anchor – monitor position, monitor other traffic, tidal current trends

40.2. Re-examine sample bridge operating procedures addressing ECDIS

- Simplified bridge operating procedures addressing ECDIS should include (but should not be limited to) the following:
  - Maintain visual lookout supplemented by ARPA & ECDIS
  - Validate correct functioning of electronic instruments at regular intervals
  - Manage chart database and updates
  - Maintain voyage plans & files (consistent with approved and filed copies)

40.3. Define safe and practical navigation with ECDIS

- Safe and practical navigation with ECDIS should include (but should not be limited to) the following:
  - Use of ECDIS unit itself:
    - Make setup choices for specific conditions
    - Recognize that bridge team members may be viewing the ECDIS for widely differing purposes, therefore setups should be accommodating
    - Perform visual scanning techniques applied to ECDIS pages/screens
  - Use of instruments integrated with the ECDIS (centralization of information):
    - Cross check (trust but verify) displayed information by all other available means
    - Verify settings and functions of sensors connected to ECDIS
  - Acknowledgement of the “Problem of Partial Use” (unfamiliarity with the unit and/or procedures may lead to distracting problem solving attempts at inopportune times, or to a disuse of the unit altogether, neither of which improves the safety of navigation). Therefore, navigators should:
    - Know what can and cannot be accomplished before the need arises
    - Know that limited or restricted use results in unverified and unintended settings
    - Perform on ECDIS anything done on a paper chart
    - Perform on ECDIS things that cannot be otherwise done as effectively or efficiently

40.4. Examine evolving concepts of e-navigation with regards to ECDIS

- With regards to ECDIS, the evolving concepts of e-navigation appear to be leading toward a thorough and uniform level of competence, reliability and usage of ECDIS in all aspects of navigation. The e-navigation strategy implementation also depends upon ENC availability, coverage, consistency and quality (NAV 56/8/7).
- Comprehensive practice with ECDIS is essential for achieving one of the stated purposes of e-navigation, namely, to prevent the overburdening and distraction of the seafarer.
- “The vision behind the e-navigation strategy … is to integrate existing and new navigational tools, in particular electronic tools, in an all-embracing transparent, user-friendly, cost-effective and compatible system that will contribute to enhanced navigational safety … while simultaneously reducing the burden on the navigator.” NAV 56 summary (7/2010)

EV – 1 Written evaluation (1.0 hr)

The trainee shows knowledge and comprehension in the learning areas of ECDIS that could not be otherwise demonstrated by workstation tasks or in simulation exercises

- Correctly answer questions:
  - Each written evaluation will consist of at least 25 questions (see ECDIS Theory Test - Sample in Part E, below)
  - The selection of questions cover all segments of the course requiring assessment in leaning dimensions of knowledge and comprehension,
  - Each evaluation will reflect a similar distribution of questions drawn from the learning objectives listed above.

Instructor guidelines

- Administer written evaluation according to defined procedures
- Score performance according to standards and measures as defined
- While grading exam, trainees should be offered a course critique to complete
- Passing score should be set at 70%

Ev. – 2 Simulation evaluation – coastal & confined waters (2.5 hrs)

The trainee operates specific functions for route monitoring in coastal and confined waters, and obtains all relevant information for safe navigation

- Demonstrate the following task groups on ECDIS while navigating safely in coastal & confined setting with potentially threatening targets in specified waters:
  - Monitor sea area,
  - Use route created by trainee including route schedule,
  - Select user layers created by trainee
  - Validate own ship's position by alternate means,
  - Check settings such as vector time, display reset, information layers, alarms, track, sensors, and ownship configurations.
  - Use ECDIS features to assess target threats and execute course and/or speed alterations to avoid collision
  - Modify route as instructed, checking for safety and adjusting schedule,
  - Assess tide and current, adjust ETA for timed arrival at waypoint as instructed,
  - Comply with COLREGS
  - Comply with bridge procedures established by trainee and/or instructor

Instructor guidelines

- Conduct simulation exercise according to exercise description:
  - Set simulation parameters
  - Define unsafe navigation as that involving a clear violation of minimum under keel clearance or CPA, where such a violation will require a retake of the underway evaluation
  - Conduct grading on ECDIS underway score sheet for (see Part E – Evaluation and Assessment)
  - Remotely monitoring of trainees' ECDIS use for grading of all tasks listed on the score sheet
  - Brief trainees
  - Passing score should be set at 70%
  - Debrief each trainee who experiences a violation of safe navigation to ensure understanding prior to attempting a second evaluation

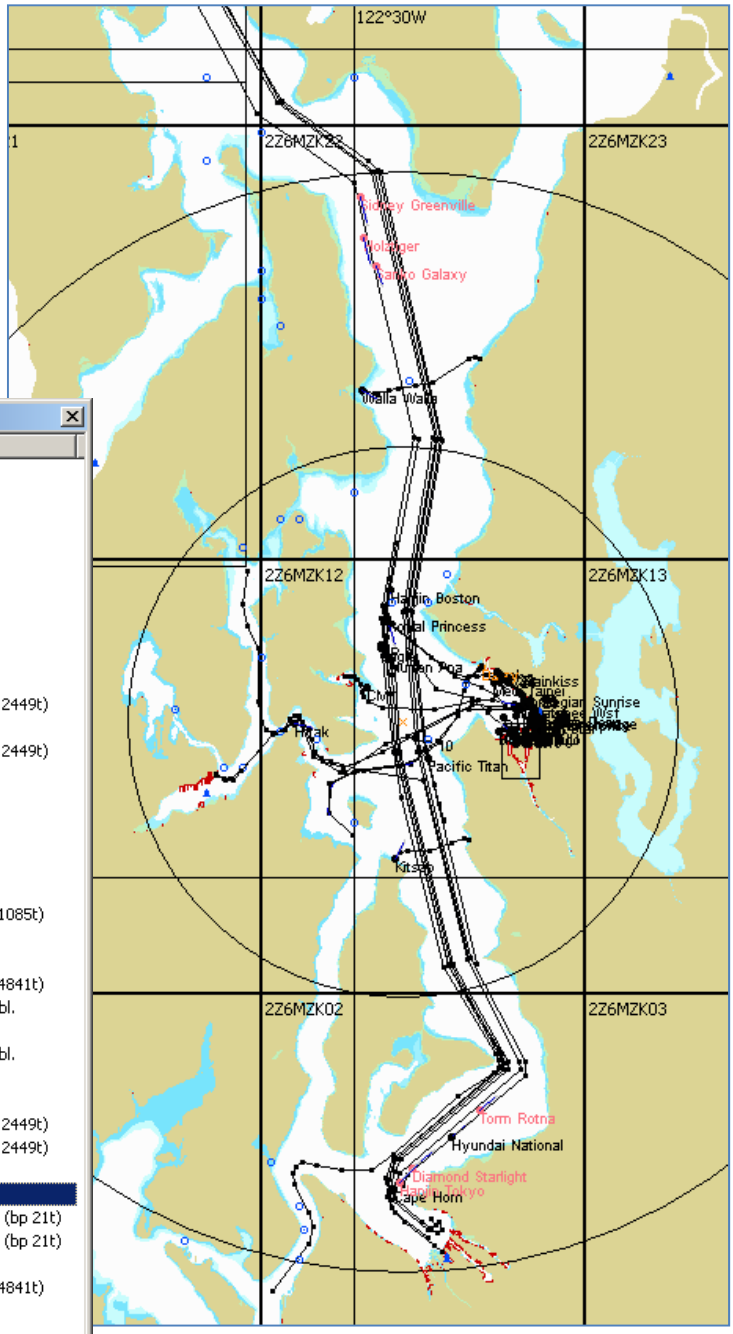
- Consider the following options in designing scenarios for Underway Evaluation (for descriptions of optimal simulator arrangements, see Part A - course Framework; also App.4 and App. 5 in Appendices for the Instructor):

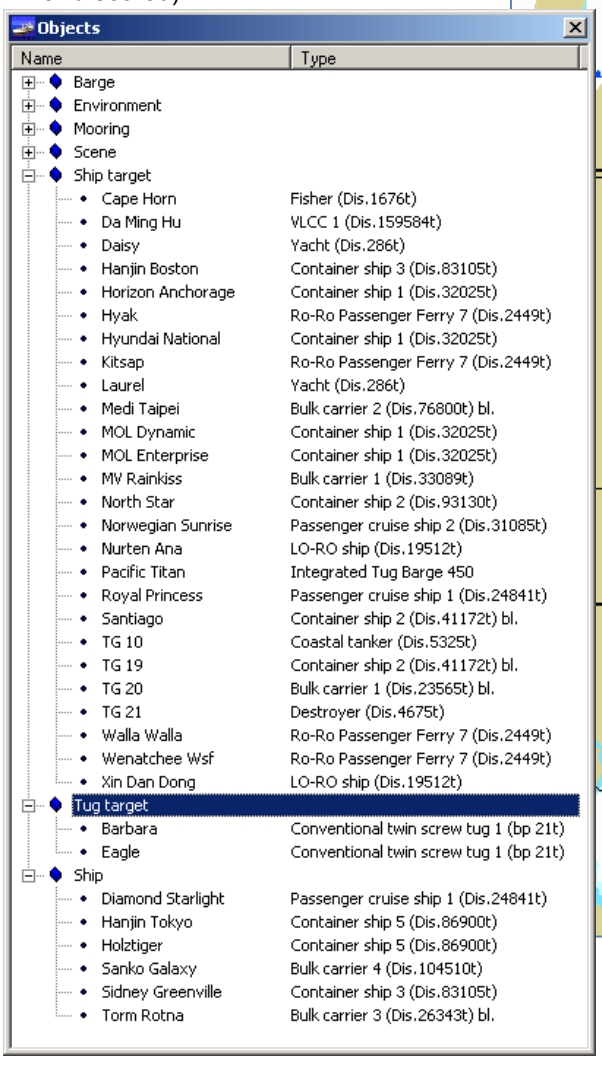
Option for Underway Evaluation

Piloting in semi-confined waters for 6 ownships

Task groups:
- Create route (from prior lesson) and apply route; modify route underway
- Safe navigation through skills integration
- Adapt instruments to conditions
- Adapt track-keeping to workload
- Comply with VTS and TSS rules

Outcomes:
- Navigate with ECDIS
- 1-person watch
- Cooperative navigation
- Visual lookout
- Maneuvering
- ECDIS Competency Assessment (use of all ECDIS functions is observed and scored)




Objects
Name
Type
Barge
Environment
Mooring
Scene
Ship target
Cape Horn Fisher (Dis.1676t)
Da Ming Hu VLCC 1 (Dis.159584t)
Daisy Yacht (Dis.286t)
Hanjin Boston Container ship 3 (Dis.83105t)
Horizon Anchorage Container ship 1 (Dis.32025t)
Hyak Ro-Ro Passenger Ferry 7 (Dis.2449t)
Hyundai National Container ship 1 (Dis.32025t)
Kitsap Ro-Ro Passenger Ferry 7 (Dis.2449t)
Laurel Yacht (Dis.286t)
Medi Taipei Bulk carrier 2 (Dis.76800t) bl.
MOL Dynamic Container ship 1 (Dis.32025t)
MOL Enterprise Container ship 1 (Dis.32025t)
MV Rainkiss Bulk carrier 1 (Dis.33089t)
North Star Container ship 2 (Dis.93130t)
Norwegian Sunrise Passenger cruise ship 2 (Dis.31085t)
Nurten Ana LO-RO ship (Dis.19512t)
Pacific Titan Integrated Tug Barge 450
Royal Princess Passenger cruise ship 1 (Dis.24841t)
Santiago Container ship 2 (Dis.41172t) bl.
TG 10 Coastal tanker (Dis.5325t)
TG 19 Container ship 2 (Dis.41172t) bl.
TG 20 Bulk carrier 1 (Dis.23565t) bl.
TG 21 Destroyer (Dis.4675t)
Walla Walla Ro-Ro Passenger Ferry 7 (Dis.2449t)
Wenatchee Wsf Ro-Ro Passenger Ferry 7 (Dis.2449t)
Xin Dan Dong LO-RO ship (Dis.19512t)
Tug target
Barbara Conventional twin screw tug 1 (bp 21t)
Eagle Conventional twin screw tug 1 (bp 21t)
Ship
Diamond Starlight Passenger cruise ship 1 (Dis.24841t)
Hanjin Tokyo Container ship 5 (Dis.86900t)
Holztiger Container ship 5 (Dis.86900t)
Sanko Galaxy Bulk carrier 4 (Dis.104510t)
Sidney Greenville Container ship 3 (Dis.83105t)
Torm Rotna Bulk carrier 3 (Dis.26343t) bl.

Part E –Evaluation and Assessment

Introduction

Consistent with the inclusion of detailed training objectives for ECDIS into the 2010 Manila Amendments to STCW, the evaluation plan that follows addresses instrument-related competencies along with proficiencies on integration of ECDIS with navigational practices. It is consistent with the intent of STCW that demonstration of skills and practical understanding is determined by direct observation, while knowledge and theoretical understand is determined through written examination in a variety of question styles.

Proficiency checklists and score sheet

Where proficiencies are specified for a specific make and model of ECDIS, the instructional designer adapting the Model Course should apply the task or concept to the specific ECDIS available in training. This will be particularly appropriate for the Proficiency Checklist that follows in this Part. The specific tasks of that document should, in fact, be used as a method to validate the transference and transferability of skills between one specific ECDIS unit and another. It is well suited to the classroom or open lab training environment. The Simulation Checklist, on the other hand, provides a less specific method, but no less focused, more suitable for evaluating and scoring underway skill sets during solo navigation exercises. For a more specific approach to scoring ECDIS proficiencies, a sample score sheet and associated tally sheet are provided. These rely on the grouping of tasks introduced through the Simulation Checklist.

This Part contains the following evaluation and assessment tools:

- **Proficiency Checklist for type approved ECDIS**
- **Simulation Evaluation Proficiency Checklist**
- **Sample ECDIS underway score sheet**
- **Sample ECDIS evaluation tally**
- **ECDIS Mid-course Exam - Open reference**
- **ECDIS Theory Test - Sample**

■ Proficiency Checklist for type approved ECDIS

These tasks are most effectively mastered by:
- Following a developmental sequence, and
- Practicing them in navigational contexts (in other words, when underway).
- References: Type approved ECDIS *User Manual*
- Other ECDIS docs: *Technical; Operating Principles; Software Description*

Basic Tasks		***User Manual***
1	Identify all Control panels, Task panels, Operational panel buttons, Multi-panel	
2	Enable / disable auto-hide (Show) of Control panel; move Control panel windows	
3	Set screen color palette – Day / night / etc.;	
4	Open all Tasks – leave open and become familiar with Tabs for each Task panel	
5	Set orientation of Main display – N / H / C	
6	Set mode of Main display – TM / RM	
7	Select Dual display – alignment / mode / orientation / scale choice	
8	Drop and return ownship symbol – View, then Ahead, F8, icon, Position Dropped	
9	Reposition ownship in Relative Motion	
10	Use ERBL – offset; info window; from ownship for CPA & TCPA; VRM options	
11	Select vector length – fixed / variable	
12	Select chart by position & when position is dropped – active list / table	
13	Find / load chart anywhere – View (Review) & Enter repeatedly	
14	Select Chart Autoload options – on / fix / off	
15	Set Chart Autoscale – on / off; manual scaling in Chart Area window	
16	Select correct scale to show chart layers – Zoom, use + & -, scale, “zoom box”	
17	Select chart display categories – Shift-F7 / Shift-F8 [hot keys]	
18	Obtain chart object information – vector chart, user chart (Add Info)	
19	Set Antigrounding – Safety Contour / Depth	
20	Set Area approach – category selection, time before approach	
21	Set Navigational danger approach – distance	

Overall Presentation of Display		
22	Select position & time from best available source	
23	Cancel / verify / modify position offset	
24	Select chart & scale appropriate to location	
25	Create uncluttered display, depending upon context and conditions	
26	Choose Main or Dual display in best mode & orientation to view ownship	
27	Load a pre-checked and approved Route for monitoring; load existing schedule	
28	Select Safety Parameters appropriate to location, route monitored and traffic	

Intermediate Tasks		***User Manual***
29	Create route plan – rough draft, save, WP editor, scaling with + & -	
30	Edit route plan – Focus on Route, fine tune, data entry, link, delete	
31	Adjust distance calculations in route planning	
32	Perform safety check in route planning – Function Panel / Check Editor	
33	Create & modify Route Schedule ETD, ETA, speeds – Function Panel / Schedule	
34	Select Route Data in Multi-panel	
35	Use waypoint selection – auto / manual	
36	Set / select Route Monitoring alarms – Monitoring / Navigational Alarms	
37	Select Route Monitoring features to show – Monitoring / Route Monitoring	
38	Select Navigation Alarm features to show – Monitoring / Navigational Alarms	
39	Observe alarm condition (Alarm panel) – active /general / area	
40	Set Time Zone for ship's time	
41	Select time icon to display – UTC / ship's time	
42	Observe & assess target information – display buttons, Target Table, tracks, View	
43	Sort targets in table – name, alias, CPA, TCPA	
44	Select AIS target identifier; set AIS voyage data; manage AIS messages	
45	Search for targets listed in table	
46	Set & select target alarm – CPA & TCPA	
47	Assess dangerous target(s) – graphically	
48	Set anchor watch guard ring & alarm	
49	Select tidal information (Task / Tides) – Diagram, table, find place	
50	Observe tide & current information – Multi-panel Environment Data	
51	View Logbook – Select date & event groups (filter); go to logbook entry on chart	
52	Make manual entry in the Ship Log – Event button, enter remarks	
53	Unload & load existing Add Info charts – Info panel A & B, Task panel	
54	Select Add Info features to show / hide	
55	Create Add Info with attributes – name & save, view hidden / danger	
56	Edit existing Add Info chart – resave, delete, restore, merge, object search	
57	Select Manual Correction features to show / hide	
58	Manual Correction – show all / hide all / go to / shift / delete objects	
59	Create Manual Corrections with attributes – view / hidden / timing / attached file	
60	Activate Man Overboard function – interpret course-to-steer to return	

Navigator Tasks		***User Manual***
61	Install / delete chart data – Chart manager	
62	Install chart updates – proprietary chart format (TX-97, for example)	
63	Install chart updates – ENC chart format (S-57)	
64	Create & modify User Graphic configuration	
65	Select chart data formats for initialization – Advanced Databases	
66	Modify sensor attachments – ports, rate	
67	Modify ownship setup	
68	Select System Time by GPS	
69	Select Entry timing for automatic log entry – configure watch cycle	
70	Copy files using Data tool – between hard drive and external media	
71	Convert (.txt) & View Logbook files using Data Tool; Print log selection	
72	Import ECDIS Add Info files using Data Tool - .cra copied as .ai	
73	Import ECDIS Route files using Data Tool – .rte copied as .rt3	
74	Convert (.cvt) & View Route to Text files using Data Tool; Print route plan	
75	Create SAR date – load as Route to monitor	
76	Copy route plan to external media from route planning	
77	View and copy route plan as Excel table from route planning	
78	Delete route plan(s) – Route panel, Windows Explorer, Data Tool	
79	View track history graphically from Route Monitoring	
80	Playback – select date, start position. Cursor data entry	
81	Set up network configuration – Master & Slave (Slave in Backup mode)	
82	Equalize route files from Master to Slave station	
83	Equalize Add Info files from Master to Slave station	
84	Equalize manual updates from Master to Slave station	
85	Connect AIS Pilot Plug – configure for positional information	
86	Set DR for AIS targets	
87	Set & delete training targets	

■ Simulation Evaluation Proficiency Checklist

	Trainee:	*A.*	*B.*	*C.*	*D.*	*E.*	*F.*	*G.*	*H.*	*I.*	*J.*	*K.*	*L.*
	Bridge :												
	Simulation Evaluation												
	Task (see following pages for details)												
1.	*Use all nav systems interfaced with ECDIS*												
2.	*Verify settings of interfaced sensors*												
3.	*Check that settings conform to procedures*												
4.	*Monitor info on ECDIS for safe navigation*												
5.	*Verify position by alternate means*												
6.	*Adjust settings to suit conditions*												
7.	*Use ECDIS-managed track control autopilot*												
8.	*Maneuver using accepted navigation practice*												
9.	*Manage contacts by AIS & radar interface**												
10.	*Assess environmental factors**												

Score each task 3, 2, or 1 according to Evaluation Methods listed below. Max score = 30 pts. Minimum passing score = 21 pts (70%).

Trainee name/ID & score					
A			***G***		
B			***H***		
C			***I***		
D			***J***		
E			***K***		
F			***L***		

NOTES: Methods for evaluating competence: Assessment of evidence obtained from approved ECDIS simulator training in underway scenarios utilizing ship control, visual scene and sensors providing integrated input to ECDIS including radar, target tracking, positioning, and AIS. (See also STCW B-I/12, Guidance regarding the use of simulators, and B-II/1 and BII/2, Guidance regarding the certification of officers.) Criteria for evaluating competence: Information obtained from ECDIS is correctly interpreted and analyzed taking into account the limitations of the equipment and prevailing circumstances and conditions.

Use all navigation systems interfaced with ECDIS ***[Uses most/all = 3; uses some = 2; uses none = 1]***

.1 Determine what ECDIS functions are integrated with other navigation systems in the particular installation
Examples: Position from AIS-DGPS; time from GPS; radar overlay (RIB); radar tracked targets; autopilot track control; compasses;

Verify settings of interfaced sensors ***[Verifies most/all = 3; verifies some = 2; verifies none = 1]***

.2 Routinely inspect sensors interfaced to ECDIS for correct settings and functioning
Examples: GPS allowable fix quality; depth mode for echo sounder (DBK, DBS); ECDIS route display enabled on radar;

Check that settings conform to procedures ***[Checks most/all = 3; checks some = 2; checks none = 1]***

.3 Check the following settings on ECDIS in an efficient manner and ensure they conform to established procedures:
a. Alarm parameters for areas, anti-grounding, contacts, time functions
b. Completeness of chart data, chart licensing status, and chart update status
c. Navigation system backup arrangements

Monitor ECDIS information for safe navigation ***[Monitors most/all = 3; monitors some = 2; monitors none = 1]***

.4 Monitor the following information on ECDIS in a manner that contributes to safe navigation:
a. Sea area
b. Position
c. Navigation information
d. Route monitoring
e. Chart information
f. Contact information
g. Status of alarms and indicators

Verify position by alternate means ***[Confirms by two alternates = 3; confirms by one alternate = 2; confirms by no alternates = 1]***

.5 Confirm the accuracy of vessel position on ECDIS by alternate means
Examples: Radar overlay; radar cursor (or VRM/EBL); secondary position source (PS2) by alternate GPS, Loran, etc.); visual LOPs;

Adjust settings to suit conditions ***[Adjusts most/all = 3; adjusts some = 2; adjusts none = 1]***

.6 Adjust the following settings and values on ECDIS to suit the present conditions:
a. Sea area display, mode and orientation
b. Chart display categories
c. Chart selection, scale, and automatic functions
d. Route plan and/or route schedule
e. User-created information layers
f. AIS interface functions
g. Radar overlay

Use ECDIS-managed track control autopilot ***[Effective use of track control = 3; some use of track control = 2; no use of track control = 1]***

.7 Adjustments made to ECDIS-controlled track keeping functions to maintain safety of navigation
Examples: Adjust autopilot parameters; re-align route plan intended for track control & perform safety check prior to Monitoring; verify track control;

Maneuver using accepted navigation practice ***[Effective maneuvers = 3; some inefficiencies in maneuvers = 2; unsafe maneuvers = 1]***

.8 Decisions to amend course and/or speed are both timely and in accordance with accepted navigation practice
Examples: Use ECDIS trial maneuver for maneuver planning; use CPA/TCPA alarms on ECDIS; apply COLREGS; observe transit restrictions for given port;

Manage contacts by AIS & radar interface* ***Effective contact management = 3; some inefficiencies in contact management = 2; unsafe/no contact management = 1]***

.9 Identify contacts repeated on ECDIS from AIS and/or radar, and communicate with contacts by text messaging through ECDIS-AIS interface
(* Interfacing is recommended but not required.)

Assess environmental factors* ***Effective use of available functionality = 3; some sue of available functionality = 2; no use of available functionality = 1]***

.10 In addition to onboard environmental sensors interfaced with ECDIS, access port-supported binary messaging, and real-time tidal gauge data
(*Functionality is optional through ECDIS licensing and by regional availability.)

■ Sample ECDIS underway score sheet

Task groups – The task groups shown below provide organization and flexibility to scoring underway proficiencies in ECDIS. These are meant to isolate significant skill sets directly related to effective ECDIS navigation. The groups that focus on ECDIS account for using critical interfaces on ECDIS (1), procedural setups (3), relevant info (4), all position options (5), and making adjustments (6). The other groups account for externals critical to effective ECDIS navigation.

No.	Task Group	Focus
1	*Use all navigation systems interfaced with ECDIS*	On ECDIS
2	*Verify settings of interfaced sensors*	Other sensors
3	*Check that setting conform to procedures (briefing)*	On ECDIS
4	*Monitor information on ECDIS for safe navigation*	On ECDIS
5	*Verify position by alternate means*	On ECDIS
6	*Adjust settings to suit conditions and adapt to changing conditions*	On ECDIS
7	*Use ECDIS-managed track control autopilot*	On autopilot
8	*Maneuver according to accepted navigational practice and with regard to COLREGS*	Conning & situational awareness
9	*Responses to role play with regards to ECDIS use*	Situational awareness with VTS on ECDIS
10	*Manage AIS and assess environmental conditions*	On ECDIS (optional)

The last group (On ECDIS: manage AIS and assess environmental conditions) is considered optional for two reasons: First, AIS messaging and environmental factors such as tidal current cycles may not suit all evaluation exercise scenarios, and second, not all Integrated Multiple Ownship Simulators can be expected to include this functionality, although they should since these are commonly a vital and integral aspect of navigation in confined and semi-confined waters.

Sample score sheet – The sample score sheet shown below is meant for each trainee in the underway evaluation. Instructions are to: Score 3 (all), 2 (some), or 1 (not enough), or leave blank if n/a. Scoring 0 on [*] (in Task group 8) represents a Critical Fault. In that instance, the trainee should retake the evaluation because it is always plausible that better use of ECDIS would have mitigated the dangers related to close quarters and proximity to shoal water. An important consideration used in this scoring scheme is to avoid a penalty for un-scored tasks, unless the entire Task Group is un-scored.

The scoring could be kept simple with the use of integers, or decimal values could be used for finer differentiation. Consistency in either case is essential. The values recorded in the underway score sheet are applied in the evaluation tally with weighted averages for each Task Group.

ECDIS Underway Score Sheet

1.10000 = Average of weights

Scoring: Leave blank if n/a; Enter: 3 (all), 2 (some), 1 (not enough);
Entering 0 on [*] (in Task group 8) triggers Critical Fault (retake evaluation)

Task groups:		***score***	***comment***	
Use all navigation systems interfaced with ECDIS – on ECDIS				
1	Tag targets			1
1.5	Acquire radar targets			2
	DGPS on PS1			3
Verify settings of interfaced sensor – other sensors				
2	GPS HDOP recorded			4
1.0	Sounder set to DBK			5
	Speed log set to BT			6
	PS2 unit on & initialized			7
	Radar displaying route			8
	AP settings adjusted for Track Control			9
Check that setting conform to procedures (briefing) on ECDIS				
3	Anti-grounding parameters set			10
1.5	Vector length set			11
	Route monitored			12
	Route waypoints named & displayed			13
	Route XTE zones set for passage			14
	Ship Time Zone set			15
	Paper chart backup: route, DR, notes			16
Monitor information on ECDIS for safe navigation – on ECDIS				
4	EC look ahead - occasional			17
1.5	EC scale adjusted - occasional			18
	EC chart choice			19
	Route Data panel displayed			20
	Query tracked targets, chart objects			21
	Acknowledge alarms			22
Verify position by alternate mean – on ECDIS				
5	Cursor from radar on EC			23
1.0	PS2 input into EC (if on)			24
	Radar overlay - occasional			25
	Paper chart: plot visual & radar fixes			26

Adjust settings to suit conditions and adapt to changing conditions – on ECDIS				
6	Set day/night palette			27
1.5	Custom layers set for low clutter			28
	Dual panel - full screen + MultiPanel			29
	Route plan schedule set for ETAs			30
	ETA + speed made good on MultiPanel displayed			31
	CU/HU/NU mode, RM/TM			32
	Revise route as needed			33
	Add Info layers used & revised			34
	Radar overlay adjusted			35
Use ECDIS-managed track control autopilot – on autopilot				
7	Track Control - occasional			36
0.5	TC turns follow safe radius on EC			37
Maneuver according to accepted navigational practice and with regard to COLREGS – conn & situational awareness				
8	VHF contact made			38
1.0	Proactive passing arranged			39
	[*] Safe CPA at all times			40
	Safe turns executed			41
	Safe speed at all times			42
	[*] Safe DBK at all times			43
	Nav lights on			44
	Fog signals on			45
	Rough Log completeness			46
Responses to role play with regards to ECDIS use – situational awareness with VTS on ECDIS				
9	Provide ETA on request			47
1.0	Provide revised plan on request			48
	Provide environmental info on request			49
	Call in to VTS on request			50
Manage AIS and assess environmental conditions – on ECDIS (optional)				
10	AIS messaging managed from EC			51
0.5	RIB targets tracked on EC			52
	Display tide & current info on EC			53
	Query tide & port info on EC			54

■ Sample ECDIS evaluation tally

Evaluation tally – For each trainee, a score is delivered to each Task Group on the evaluation tally directly from the underway score sheet:

*[1] Task Group = Avg of tasks*Weight*

As noted above, blank entries for specific tasks in the underway score sheet are disregarded in this initial averaging per Task Group. The intent is to provide a flexible scoring system in the event that certain devices are not included in the integrated simulation. On the other hand, simply entering a zero value in place of a blank will cause that entry to be included in the average, significantly penalizing omitted behaviors, and rendering the scoring system far more rigorous. Such a choice should be left to the training course developer, and should not be directly dictated by a scoring system. The formulation here yields to the scorer (0 or blank).

Each trainee's total score is represented by the average of non-zero values:

[2] Avg = Σ Task Group scores / Σ Weights [excluding #10 if blank]

The achievement of each trainee by percentile is determined by utilizing 3 as the maximum possible score for any given task in the score sheet:

[3] Score % = Avg [non-zero] / 3

There is considerable value in tracking the average scores by Task Groups over a succession of underway evaluation exercises, in particular to aid in assessing and validating the outcomes of the ECDIS navigation training overall. For example, certain Task Groups may show under-performance over several iterations, indicating the need for revised emphasis of certain tasks in the underway context. Likewise, the overall score for the evaluation exercise can be determined and tracked.

For each Task Group across all trainees:

[4] Max score = Task Group Weight / 3

For the non-zero values of each Task Group:

[5] Task Group Avg = Avg [formula 2]

For the tally of each Task Group by percentile:

[6] Task Group % = Task Group Avg / [formula 4]

For the overall evaluation score:

[7] Score = [formula 5] / Σ Weights [excluding #10 if blank]

ECDIS evaluation tally

Trainee:								**Session:**	
		A	*B*	*C*	*D*	*E*	*F*		
Bridge:									
Date:									
Simulation Evaluation									
Task (see underway score sheet for details)								Avg.	
1	*Use all nav systems interfaced with ECDIS*								
2	*Verify settings of interfaced sensors*								
3	*Check that settings conform to procedures*								
4	*Monitor info on ECDIS for safe navigation*								
5	*Verify position by alternate means*								
6	*Adjust settings to suit conditions*								
7	*Use ECDIS-managed track control autopilot*								
8	*Maneuver using accepted navigation practice*								
9	*Manage contacts by AIS & radar interface**								
10	*Assess environmental factors**								
	Average (non-zero):								
	Score (%):								

[1] *[2]* *[3]* *[4]* *[5]* *[6]* *[7]*

■ ECDIS Mid-course Exam - Open reference

Multiple choice: Select the best answer and cite Revised P.S. (MSC.232(82))

1. The **primary function** of ECDIS is to:
   a. Eliminate the need to use paper charts.
   b. Reduce the number of persons on the bridge.
   c. Contribute to safe navigation
   d. Computerize shipboard navigation

   C – PS 1.1

2. An important **benefit** of ECDIS is:
   a. Simple and reliable updating of the ENC
   b. Reducing navigational workload
   c. Providing appropriate alarms or indications
   d. All of the above.

   D – a) PS 1.4, b) PS 1.5, c) PS 1.8

3. Which of the following is **mandatory equipment** that must be connected to ECDIS?
   a. Radar/ARPA
   b. Positional navigation sensors (e.g., GPS)
   c. Track control (autopilot)
   d. AIS

   B – PS 2.1, 10.5.7, 12.2

4. Aside from the requirements for the Display Base and Standard Display, who selects the display categories of the "**All other information**" display level?
   a. The hydrographic office issuing the ENC data
   b. The ECDIS manufacturer
   c. The mariner
   d. All of the above

   C – PS 2.1, Appx. 2 Item 2.3

5. Which of the following is "**equivalent to an up-to-date paper chart**."?
   a. The ENC
   b. The SENC
   c. The ECDIS display
   d. Official updates in digital format

   D – PS 2.3

Short-answer: Write a brief explanation (2-lines) and cite the relevant P.S. paragraph

6. What is the difference between an **ENC** and the **SENC**?

   ENC – database issued by hydrographic office that contains all chart info needed for safe navigation; may contain supplemental info *[PS 2.2]*

   SENC – database transformed by ECDIS; equivalent to up-to-date paper chart; may contain info from other sources *[PS 2.3]*

7. What is the difference between **Standard Display** and a **Display Base**?

   Standard Display – level of SENC info shown when ECDIS first turned on; used for route planning; can be modified by mariner depending on needs *[PS 2.4]*

   Display Base – level in info that cannot be removed from display; required at all times; not intended for safe navigation *[PS 2.5]*

8. What is meant by the –term **"single operator action"**?

   Note: Mentioned in IMO PS but not adequately defined!

   Examples: Standard Display *[PS 3.3]*, Remove radar info *[PS 6.2]*
   Also: "shown on demand" *[PS 9.5]*, "displayed on demand" *[PS Appx.2 Item 3]*
   "manually on demand" (or Event) *[PS 10.5.12.1]*

9. In regard to the **scale of the display**, what are two important indications that an ECDIS must show?

   1. Info that is displayed at larger scale than ENC *[PS 5.1]*
   2. Ship's own position covered by ENC at larger scale *[PS 5.2]*

10. What is the difference between an **Indication** and an **Alarm**?

    Alarm – announced by audible and/or audible & visual means; a condition that requires attention
    [PS Appx. 5]

    Indicator – a visual indication about condition of system or equipment
    [PS Appx. 5]

11. In the Route Planning Mode, what are the four primary ways to **adjust a planned route**?

    1. Adding waypoints
    2. Deleting waypoints
    3. Changing the position of waypoints
    4. Alphanumerically & graphically *[all PS 10.4.2]*

12. During **Route Monitoring**, what are the two primary things that should always appear on the ECDIS display?

    1. Selected route
    2. Own ship's position *[both PS 10.5.1]*

13. In terms of voyage recording, what are two major **types of data that must be recorded** at one-minute intervals during the previous 12 hours?

    1. Record of own ship's track; time, position, heading, speed *[PS 10.6.1.1]*
    2. Record of official data used (e.g., ENC) *[PS 10.6.1.2]*

14. What are the two primary **reasons for backup arrangements** in case of ECDIS failure?

    1. Safe take-over of ECDIS functions; avoid critical condition *[PS 14.1]*
    2. Safe navigation for remaining part of voyage *[PS 14.2]*

15. What is meant by **"ship's safety contour"**?

    Selected from depth contours provided; more emphasis shown **(bold)** than other contours *[PS 3.8]*

    Indication provided during route planning *[PS 10.4.4]*

    Alarm given if approaching within a specified time period *[PS 10.5.3]*

    Default safety contour: 30m or next deeper *[PS 3.8.1]*

Multiple choice: (Questions 16-35 are typical of those presented on certificate examinations.)

16. If the electronic chart is part of an ECDIS, it must display the minimum data required by IMO/IHO, to include all of the following EXCEPT _____.
    a. Hydrography
    b. aids to navigation
    c. tidal currents
    d. regulatory boundaries

17. Which of the following must the electronic chart of an ECDIS display, as required by IMO/IHO?
    a. Hydrography
    b. Ferry routes
    c. Regulatory boundaries
    d. All of the above

18. ECDIS units incorporate Digital Chart Data Formats, which include _____.
    a. vector only
    b. raster only
    c. vector and raster
    d. imposed viewing

19. Which of the following are data layer categories to be displayed on ECDIS?
    a. ECDIS warnings and messages
    b. Hydrographic Office data
    c. Notice to Mariners information
    d. All of the above

20. Which of the following data layer categories is NOT displayed on ECDIS?
    a. Notice to Mariners information
    b. ECDIS warnings and messages
    c. Ship hydrodynamic information
    d. Hydrographic Office data

21. The database resulting from (1) the transformation of the electronic navigational chart (ENC) by ECDIS for appropriate use, (2) the updates to the ENC by appropriate means, and (3) the additional data added by the mariner, is called the _____.
    a. Display base information
    b. Standard display information
    c. System electronic navigational chart
    d. Chart display information

22. The database information that should be shown when a chart is first displayed on ECDIS is the _____.
    a. Display base information
    b. Standard display information
    c. System electronic nautical chart
    d. Chart display information

23. The level of database information which cannot be removed from the ECDIS display and consists of information which is required at all times in all geographic areas and under all circumstances is the _____.
    a. Display base information
    b. Standard display information
    c. System electronic nautical chart
    d. Chart display information

24. ECDIS must give an alarm for which of the following cases?
    a. When the specified limit for deviation from the planned route is exceeded
    b. If the ship, within a specified time set by the watch officer, is going to cross a safety contour
    c. If the ship, within a specified time set by the watch officer, is going to cross the boundary of a prohibited area
    d. All of the above

25. ECDIS must give an alarm for which of the following cases?
    a. If the ship is going to reach a critical point on the planned route
    b. When the speed of a dangerous target exceeds a set limit
    c. If the ship's ETA has changed beyond the set limit
    d. All of the above

26. ECDIS must give an alarm for which of the following cases?
    a. When the speed of a dangerous target exceeds a set limit
    b. When the specified limit for deviation from the planned route is exceeded
    c. If the ship's ETA has changed beyond the set limit
    d. None of the above

27. Chart information details to be used in ECDIS should be the latest edition of information originated by a government-authorized hydrographic office and conform to the standards of (the) _____.
    a. International Maritime Organization
    b. International Hydrographic Organization
    c. NASA
    d. US Coast Guard

28. An ECDIS is required to display which information?
    a. Radar targets
    b. ARPA vectors
    c. Hydrographic data
    d. All of the above

29. ECDIS must have the capability to preserve the record of the voyage track for the previous _____.
    a. 4 hours
    b. 6 hours
    c. 12 hours
    d. 24 hours

30. Which data must ECDIS be able to record at one-minute intervals?
    a. Position
    b. Electronic navigational chart source
    c. Course made good history
    d. All of the above

31. An ECDIS is required to display which information?
    a. Soundings
    b. Waypoints
    c. Meteorological data
    d. Radar targets

32. An ECDIS is required to display which information?
    a. Water temperature
    b. Climatology data
    c. Speed of advance
    d. Depth contours

33. Which data must ECDIS be able to record at one-minute intervals?
    a. Course made good history
    b. Estimated time of arrival
    c. Speed through the water
    d. Shaft RPM

34. ECDIS must be able to perform all of the following EXCEPT _____.
    a. Determine true bearing and distance between two geographical points
    b. Determine magnetic compass deviation
    c. Transform a local datum to the WGS-'84 datum
    d. Convert "graphical coordinates" to "display coordinates"

35. Which of the following must an ECDIS system be able to perform?
    a. Conversion of "graphical coordinates" to "display coordinates"
    b. Transformation of local datum to WGS-'84 datum
    c. Calculation of true azimuth and distance between two geographical points
    d. All of the above

■ ECDIS Theory Test - Sample

Name: _____ Date: _____

Read the question carefully, and then select the best answer. Mark the test. Each question = 4 points.

1. A faulty GPS position presents __ (**a great risk** / no risk) to navigation with ECDIS.

2. ECS is not intended to comply with the up-to-date chart requirements of SOLAS:
   True / False.

3. RCDS is a mode of operation using raster data, whereas the ECDIS mode uses official vector data: **True** / False.

4. When zooming out ("underscaling") on an ECDIS using vector chart data, all information layers remain on the display: True / **False**.

5. ENC data and official updates are transformed into the SENC database:
   True / False.

6. Except for Display Base, the operator selects chart data for display that is relevant to the current passage: **True** / False.

7. GPS position information is not correlated to any particular geodetic datum:
   True / **False**.

8. The position of own ship on ECDIS is unreliable if the position sensor and the displayed chart information have different geodetic coordinate systems:
   True / False.

9. Vector chart data is organized according to points, lines and polygons that are geo-referenced and have coded attributes: **True** / False.

10. Match all of the following conditions to the resulting alarm or indication:

Position system failure	1
Route planning across the safety contour	2
Larger scale ENC available	3
Actually crossing the safety contour	4

a	Indication only (visual only)
b	Alarm (audible or audible & visual)

1 → a or **b** 2 → **a** or b 3 → **a** or b 4 → a or **b**

11. a) Zooming in very close on an ECDIS is called “overscaling”: **True** / False

    b) When zooming in very close on an ECDIS displaying a vector chart, some chart objects may be dropped from the display as lost layers: True / **False**.

12. Automatic updates are transformed into the SENC in a manner invisible to the user: **True** / False.

13. ENC updates may be viewed on the ECDIS display: **True** / False

14. a) Manual corrections are transformed into the SENC as a user-added information layer: **True** / False

    b) The user cannot alter the contents of manual corrections: True / **False**

15. Vessels subject to SOLAS requirements must carry charts for the intended voyage that are issued by an official hydrographic office and that are up-to-date: **True** / False.

16. Chart data used by an ECDIS meeting SOLAS requirements is produced according to IHO S-57 edition 3 specifications: **True** / False.

17. Which of the following is a performance standard for the display of SENC information?
    a. Information contained in the Display Base can be easily removed from the display.
    b. The selected safety depth is always displayed, even with spot soundings turned off.
    c. **The selected safety contour is displayed with greater emphasis than other contours.**
    d. When a chart is first displayed, the Standard Display at the smallest scale is presented.

18. Identify the orientation and mode of display required by the Performance Standards.
    a. Ship’s draft plus under keel clearance.
    b. **North-up orientation and true motion mode.**
    c. Overwriting of the track file every 24 hours.
    d. Any orientation in either true or relative mode.

19. Which of the following reflects the statement that ECDIS only supports the mariner in performing navigational tasks?
    a. Without official updated ENC data for the intended voyage, ECDIS does not replace paper charts.
    b. ARPA targets do not show up on ECDIS unless they are acquired and tracked.
    c. ECDIS does not take the place of a proper lookout.
    d. **All of the above.**

20. Which of the following statements best describes manual chart corrections for ECDIS?
    a. **Manual corrections constitute user information layers, added by the mariner, with no automatic record of installation.**
    b. Manual corrections are included in the CD that vessels receive periodically from NGA (formerly NIMA).
    c. When U.S. Notice to Mariners are downloaded from the NGA website, the .pdf and .jpg files are automatically installed into the ECDIS chart database.
    d. All of the above.

21. What error may occur in the ECDIS if hydrographic or chart survey data is inaccurate?
    a. The vessel's geographic position may not match the charted display.
    b. Own ship may not be navigating in safe water, despite the information on the ECDIS display.
    c. Radar overlay and chart data may appear to be mismatched.
    d. **All of the above.**

22. If it is thought or known that floating aids to navigation (buoys) have shifted, how should this be interpreted on ECDIS?
    a. Charted buoy locations are always more reliable than own ship's GPS position information.
    b. ECDIS always shows the actual location of buoys.
    c. **Physical buoy positions may differ from charted locations on ECDIS, as with any type of chart information.**
    d. Buoy position changes are never included in ENC updates.

23. If the ECDIS monitor's resolution is poor or improperly set, what may be affected on ECDIS?
    a. Chart scale may be misrepresented.
    b. Chart features may not be shown in the intended color.
    c. Fineness of detail may be lost.
    d. **All of the above.**

24. Which of the following reference systems affect the information on ECDIS?
    a. Draft of vessel entered into sounder that is connected to ECDIS.
    b. Physical location of scanner for ARPA connected to ECDIS.
    c. Geodetic system used in the creation of the chart data.
    d. **All of the above.**

25. With radar overlay on ECDIS, what can be the cause(s) of radar echoes not matching the charted position of a fixed object?
    a. Incorrect input of ship's position fixing device (GPS).
    b. Improper coordinate setting of radar antenna, conning station or ship's dimensions.
    c. Either the Chart Display Category is in Base Display or the scale is so small that it is showing Layers Lost.
    d. **All of the above.**

Appendices for the ECDIS Instructor

This Part of the Model Course includes the following appendices:

- **Appendix 1: Introduction of Operational use of ECDIS**
- **Appendix 2: ECDIS Performance Standard references**
- **Appendix 3: ECDIS Carriage Requirements**
- **Appendix 4: STCW Manila Amendments on ECDIS**
- **Appendix 5: Training scenario types and scenario success**
- **Appendix 6: Integrated navigation training example**

Appendix 1

Introduction to the operational use of ECDIS

This document is the first revision to the original ECDIS Model Course 1.27 published by the IMO in 2000. In the intervening decade, several considerable advances have occurred:

- Comprehensive improvements in type-approved ECDIS, including software, chart data, PC hardware, and integration with critical ship functions
- Widespread experience in effective navigation with ECDIS aboard vessels
- Publication of textbooks, articles and information booklets on ECDIS
- Development of simulation that makes available to each trainee a certified ECDIS in an underway context with vessel controls and full visualization
- Amendments to STCW requiring competency in the use of ECDIS for all Watch Officers wherever type-approved units are installed
- The advent of track control autopilots deriving control information from ECDIS
- The advent of paperless bridges where a new generation of apprentice mates gain little or no practice in backup skills such as paper plotting of LOPs

The purpose of this Introduction is to explain in some detail:

- The importance of revising the ECDIS Model Course to establish specific minimal performance standards in the a use of ECDIS,
- How the lessons and practice can be effectively structured to produce the ECDIS proficiencies specified in the 2010 STCW Manila amendments
- Optimal simulation classroom and lab arrangements to achieve these outcomes

■ ECDIS-centered navigation training

The mastery of ECDIS can only really occur in the context of navigation. The primary objective of ECDIS training should be the effective integration of ECDIS-based digital and graphical information into the ongoing navigational situation. An important outcome of ECDIS training should be that ECDIS-based information is not the source of navigation, but a collecting point of navigational information, some repeated, some unique.

To train on ECDIS as if its information were the source of navigation is to risk the disintegration of navigational awareness, analysis and decision-making. Although this may seem self-evident to maritime trainers and educators who have stood navigational watches using ECDIS, such loss of integration is often the de facto outcome of training that is not properly conducted.

Seafarers who developed their navigational skills in the 20th Century may be able to keep ECDIS-centered training in the context of visual navigation. They may be able to regard the risks to safe navigation that are posed by exclusive focus on ECDIS for prolonged periods of time. However, seafarers developing their navigational skills in the 21st Century are likely to misapprehend the supportive role intended for ECDIS unless they are specifically trained and individually assessed in integrative skills.

ECDIS can be a very effective tool for introducing and illustrating general concepts of navigation, i.e., cartography, projections, direction, distance, depth, position fixing, plotting, sailings, deduced reckoning, buoyage, tides and currents, ocean currents. ECDIS is, by definition, an integrative tool. The attempt to present it outside the context of navigation results inevitably in its use as a substitution for navigation. On the other hand, when a navigation training program is centered on ECDIS, navigation training remains the focus and ECDIS remains a supportive tool.

■ ECDIS practice & training

Following a decade of ECDIS use onboard and of certified ECDIS training around the world, several shortcomings in practice and training have become evident. The correction of these items is a primary goal of this revised edition of the ECDIS Model Course:

- ECDIS training cannot presume the existence of skills in visual navigational
- ECDIS training will eventually serve to introduce cartography and other basics of terrestrial navigation
- ECDIS use demands efficient interaction with all source sensors
- ECDIS functions and documentation are typically not designed by seafarers and therefore should not be expected to describe system use in a navigational context or priority of importance to navigation
- Improvements in ECDIS are impeded by the type-approval process; the fact that this has not been the case with ECS should be incorporated into ECDIS training
- The single-query approach to ECDIS must be emphasized and practiced when underway to the point of habit (this is referred to as the "7-second glance" method in Lesson 4)
- All ECDIS functions must be explored to overcome the common situation where the user is trapped by an unfamiliar page or menu (this is referred to as the "Problem of Partial Use" in Lesson 4)
- The trainee must learn to regard ECDIS as if it were controlling the vessel's rudder, as eventually this integration with track control autopilot will become commonplace and reliable
- Even where Track Control integration with ECDIS is not enabled, ECDIS presentations may nonetheless include a "predictor" vector that is highly accurate when based on vessel particulars; in such instances, the ECDIS presents maneuvering information that is new in form, unique to the ECDIS, and immediately vital to the watch team, and so should be incorporated into the training when possible
- ECDIS in its present stage of type-approval is likely to be the final 2-D presentation in the evolution of navigation; its ongoing successful integration of vessel control and live chart data updates and real-time depth display is leading the way toward Augmented Reality for seafarers where navigation displays will be visualized in 3-D presentations; in other words, now is the time to learn how to reliably navigate with ECDIS
- All electronic chart data, in the near term, has not been created equal, and specification details will continue to evolve, such as Zones of Confidence
- ECDIS will always be about chart data, from user choices of cells and formats, to online updates and real-time licensing, to trustworthy indications of survey validity
- ECDIS training is most effective at establishing safe navigational practices when it is taken as the opportunity to teach new seafarers how to navigate by repeatedly integrating their scans of the horizon, vessel environment, instrument data and graphics
- ECDIS must be taught as a tool meant to enhance rather than impede safe decision making
- Reliable ECDIS installations by definition promote the deterioration of plotting skills on paper charts, such as of LOPs derived from radar and visual bearings; even with enhanced user tools on new ECDIS units, such plotting is likely to be applied as the occasional double check, at most; one countermeasure to this is the constant rehearsal of paper and electronic chart navigation during every aspect of ECDIS training (see Exercises 1-4 & Underway Evaluation)
- ECDIS users must be trained in seeking and swiftly resolving ambiguities in sensor data and its presentations, especially as it applies to visually derived information; the visual scene must therefore be included in the ECDIS training environment, and critically applied whenever possible, e.g., variable visibility, aids to navigation, prominent points, tidal conditions, contact aspect, contact data, unreliable data for position and heading and speed, etc.
- Trainees must repeatedly rehearse the setup and adaptation of ECDIS and its connected sensors as underway conditions change
- ECDIS operators should realize that all members of a watch should have something meaningful to look at, including remote displays provided for the Master and for the engineering watch; in other words, the operator should be able to adapt the ECDIS to not only the navigational purpose at the moment, but also to changing navigational points of view without suffering any loss of situational awareness

- Dividing a training course into "generic" ECDIS training (any aspect not requiring an actual ECDIS) and "type-specific" training (some selected functionality of a particular ECDIS) has produced regrettable outcomes:
    - The course is not taught as navigation using ECDIS
    - The course divests itself of responsibility for teaching and assessing the underway use of ECDIS,
    - The 3 or 4 day course making little or no use of one ECDIS unit per trainee in an integrated visual navigation setting cannot be effective in achieving the minimum objectives of the Model Course, original or revised
- Competency by the letter and the spirit of STCW means unequivocally that the trainee must be assessed individually during the course on one or another type-approved ECDIS, (the same issue was settled long ago with regards to radar, ARPA and GMDSS training)
- The issue of ECDIS competency is especially relevant under the Manila Amendments to the STCW Convention and Code through:
    - Details of expected outcomes,
    - Application to all deck watch officers sailing where ECDIS is fitted,
    - Through reference to this Model Course as presently revised
- As best practices evolve regarding ECDIS use, discussion and practice involving applicable COLREGS must be included in ECDIS training, especially where AIS and radar information can be combined in the ECDIS display (see Lessons: 3, 13, 31, 32, 36, 37, 39, 40, Proficiency Checklist, and Evaluation Checklist)
- In e-Navigation, a role is envisioned for ECDIS that is quite ubiquitous, and implies a thorough and uniform level of competence, reliability and usage. One purpose of e-Navigation aims to prevent the overburdening and distraction of the seafarer; as such, principles and practices of e-navigation must be included in ECDIS training (see Lesson 40)

■ Reliance on ECDIS

Past ECDIS training has focused on ECDIS functionality and the importance of training users to avoid over-reliance on a computer-based navigation system.

These are somewhat valid considerations, when properly qualified, but they are counter effective approaches to training. The over-arching goal of ECDIS training should be, in fact, to enable a very high degree of reliance on ECDIS as a supportive tool. This presumes an approach to the limitations inherent in every aspect of navigation, to include all instruments and sensors and visual assessments. This also presumes that ECDIS functionalities are presented for their value and priority to navigational tasks. In its most mature implementation, becoming more prevalent with most newly built ships, ECDIS is installed with the intent of effectively applying rudder through Track Control.

With this in mind, there are three crucial and related points to remember when learning and teaching ECDIS:

- At the end of the day, it is not ECDIS you are learning or teaching, but navigation using ECDIS
- What navigation actually is varies widely across the spectrum of ECDIS users, their vessels, and their waterways
- No one ECDIS setting can possibly suit all circumstances; this means that it is paramount to emphasize and practice the adjustment of settings appropriate to changing conditions, such as when changing between open and confined waters, changes in ambient light, monitoring and changing route information, etc.

All of these points require that the ECDIS trainee becomes skilled in adapting the ECDIS to a wide variety of conditions and to changes in conditions while navigating in a visual environment. In fact, the fundamental desired outcome should be that the use of ECDIS enhances rather than interferes with the safety of navigation.

ECDIS training provides nothing short of comprehensive practice in safe navigation. ECDIS training should therefore focus on the supportive tasks ECDIS has proven to perform, including:

- Positioning, route monitoring, passage planning and route making
- Contact management
- Monitoring of environmental and sensor conditions
- Integration with radar, AIS and autopilot

Without being methodically assimilated into the training, these capabilities quickly become overwhelming to the ECDIS user. Without practice in a comprehensive course, the ECDIS user will develop partial skills even over the long term, and relegate the ECDIS to a secondary role in navigation. Thus the admonition to avoid over-reliance is perpetuated.

The fallacy in this all-too-common circumstance is that ECDIS itself is unreliable. However, in a comprehensive training approach to ECDIS such as this revised Model Course proposes, trainees can discover for themselves the great extent to which ECDIS can be relied upon to improve the safety of navigation.

Keeping ECDIS training in the context of navigation means that the various functions of the device should be introduced in their order of priority to the overall project of navigation, rather than for their appeal as presented by the manufacturer. Broadly speaking, the training should approach three stages in fairly strict succession:

1 Basic (display presentation for the watch) - [Lessons 1 through 20]
2 Intermediate (adjustment of settings & data for passage) - [Lessons 21 through 31]
3 Navigator (tasks for person in charge of ECDIS) - [Lessons 32 through 35]

The Proficiency Checklist that has been developed for inclusion in this 2010 edition to the Model Course aims to keep this developmental process clearly in focus throughout the training on ECDIS. With its more than 80 items, the Checklist, in fact, firmly establishes the importance of learning ECDIS with an ECDIS unit running in simulation where there is no dire consequence to standing an inattentive watch while experimenting with ECDIS.

■ ECDIS competency

There are two significant changes with regards to ECDIS in the Manila Amendments to the STCW Code:

- The Officer of the Watch at both management and operational levels serving aboard vessels larger and smaller than 500 GT fitted with ECDIS must be certified in the operational use of ECDIS
- Competence in ECDIS is defined in its use to maintain the safety of navigation, while the knowledge, understanding and proficiency in the various tables is defined as:
  - Table A-II/1: "Navigation using ECDIS: Knowledge of the capability and limitations of ECDIS" and "Proficiency in operation, interpretation, and analysis of information obtained from ECDIS"
  - Table A-II/2: "Management of operational procedures, system files and data"
  - Table A-II/3: "Thorough knowledge of and ability to use ECDIS"

  (Tables A-II/1, A-II/2, and A-II/3, as amended, are included as Appendix 3 in the Annex to the Instructor Manual.)

The intent and specific criteria of the amended STCW Code on ECDIS is plain to see. Any Officer in Charge of a Navigational Watch (OIC) must be able to monitor information on ECDIS in a manner that contributes to safe navigation, while any Chief Mate or Master must be able to also establish, apply and monitor operational procedures for using ECDIS.

Where these skills are acquired and assessed using approved ECDIS simulator training, or its equivalent, the simulator and the associated ECDIS course of instruction must be able to produce a navigational environment where unsafe events will occur when ECDIS information is incorrectly monitored and when ECDIS operating procedures are inadequately applied.

In other words, it is the unsafe navigational events in a given scenario, where preventable by proper operation of ECDIS, which should determine the baseline competency. Interwoven with this is the opportunity to practice and apply the very many specific ECDIS functions that add up to proper operation, and which will help avoid distractions resulting from unfamiliarity with ECDIS.

The methods for demonstrating this competence require either ECDIS simulator training or its equivalent in underway experience. One purpose of this revised Model Course is to establish the high importance of replicating that underway navigational experience with ECDIS in simulator training, or its equivalent. It is fair to state that ECDIS simulator training that does not meet the "underway standard" cannot possibly satisfy the letter or intent of the revised STCW Code. It is therefore appropriate that the learning and assessment objectives of this revised Model Course and its Framework should deliver a practical demonstration of this underway standard. (See Evaluation Checklist in the Evaluation Plan of the proposed Revised Model Course, as it is applicable to some degree in every exercise.)

Perhaps the most significant challenge facing instructional design for ECDIS use is the recognition that the mastery of navigational functionality of the device does not equate to skillful and safe navigation with ECDIS. Because ECDIS is an integrative device by its structure and purpose and placement in integrated bridge systems, the use of it and its use in the various acts of navigation cannot be separated for very long.

The consequence of training on ECDIS outside of its navigational context is to develop skills that depend upon not having any other navigational distractions. This may be the most undesirable outcome imaginable for training in the use of ECDIS. Regrettably, this particular approach, common to part-task training everywhere, has taken hold in most instances of ECDIS certified training worldwide.

The STCW Manila Amendments, however, now define the fundamental competence in ECDIS as a navigation function at both levels: Maintain the safety of navigation through the use of ECDIS (See Appendix 3 in the Appendices for the Instructor). As with many other STCW navigational competencies, this desired outcome of ECDIS use must be demonstrated as a solo act, and that fact demands that safe navigation with ECDIS is practiced, and ultimately evaluated, in a solo navigational environment.

Many general aspects of navigation must be evaluated when ECDIS competence is kept in its integrated context, as well as the use of specific ECDIS functions at the right time and place. Indirectly, the behavior that is being assessed is the trainee's ability to divide attention evenly amongst all navigational aids and systems, not least being the visual scene.

When considering the STCW criteria for evaluating ECDIS competence as desired outcomes, Table A-II/1 requires:

- Monitoring appropriate information
- Interpreting that information correctly
- Controlling the vessel's speed and autopilot
- Utilizing effective communications,

Likewise, Table A-II/2 requires (in the same evaluation):

- Making and using operational procedures
- Making navigation safe by minimizing risk

Such training should encourage the application of judgment and the development of situational awareness.

■ Simulation in STCW

As given under Section A-I/12, Standards governing the use of simulators, the STCW Code requires that any simulator used for mandatory simulator-based training "be capable of simulating the operating capabilities of shipboard equipment concerned, to a level of physical realism appropriate to training objectives and assessment objectives." The content of this section of the Code has not been altered in the Manila Amendments.

As given under Section B-I/12, Guidance regarding the use of simulators, as amended, performance standards for non-mandatory simulation equipment used for training and/or assessment of competence or demonstration of skills in navigation and watchkeeping and in ship handling and maneuvering should "provide a realistic visual scenario by day or by night ..." This is in addition to meeting all applicable performance standards set out in section A-I/12. Here also, the content has not been altered from STCW-95.

However, as given under Section B-I/12, Guidance regarding the use of simulators, significant details regarding training and assessment in the operational use of the ECDIS has been added in the Manila Amendments. The source of this section of STCW is STCW.7/Circ.10, June 2001 (STW 32 and MSC 74). The Guidance section recognizes the necessity gaining practical skills on individual ECDIS simulators.

Although this guidance as STCW.7/Circ.10 predates the cost-effective technology now available for individual ownship workstations integrated with the visual scene and all instrumentation including type-approved ECDIS, the intent to promote navigational understanding and skill with ECDIS is fully relevant. "The main objective of simulator exercises is to ensure that trainees understand their responsibilities in the operational use of ECDIS in all safety-relevant aspects and are thoroughly familiar with the system and equipment used" (Section B-I/12, paragraph 47, as amended).

■ Effective ECDIS simulation

ECDIS is unlike any other navigational aid in its ability to capture the user's attention for extended periods of time. Absorption in menus, functional tasks, and potential ambiguities in information can swiftly undermine the safety of navigation even where the user has the best intentions of standing a vigilant watch. ECDIS is an encyclopedia of live information both graphic and textual, in the medium of a PC display whose near total capture of the digital age has evolved on the basis of surfing, browsing, interacting, storing, retrieving - in general, of being captivating.

Effective ECDIS training demands that each user develops the practical discipline of approaching the ECDIS with a single question to resolve at any one time - confirm position, present track tendency, confirm progress in a critical turn, next course to steer, ETA to upcoming waypoint, chart information, contact data, adjustment to display, adapting the route to changes in plans, etc. Developing this single-point query approach helps ensure that the ECDIS serves as an aid to navigation, such that its reliability can be efficiently verified.

For this form of training, each trainee in an ECDIS course adhering to this edition of the Model Course should optimally be provided with their own live ECDIS to operate and their own vessel to operate through simulation, the navigational functions of which are fully integrated.

This approach is necessary for the progressive development of skills and for the assessment of their achievement in the underway context of navigation. There is, in this optimal approach to the training, no place for multiple users on one ECDIS, or an ECDIS that is not receiving underway sensor input, or an underway environment devoid of an integrated visualization of the scene.

For all of the foregoing reasons, ECDIS simulation performance standards and the description of an optimal ECDIS training environment have been included in the Part A - Course Framework of this 2010 edition of Model Course 1.27.

Appendix 2

ECDIS Performance Standard references

The current electronic chart display and information system performance standards adopted by the Organization are:

- Resolution MSC.232(82), revision to the previous Performance Standards:
  - Applying to new ECDIS equipment installations on or after 1 January 2009

- Resolution A.817(19), Performance Standards for Electronic Chart Display and Information System (ECDIS); resolution MSC.64(67), annex 5, amending resolution A.817(19); resolution MSC.86(70), annex 4, amending resolution A.817(19):
  - Applying to ECDIS equipment installations between 1 January 1996 and 1 October 2009;

Appendix 3

ECDIS Carriage Requirements

ANNEX 1

RESOLUTION MSC.282(86)
(adopted on 5 June 2009)

ADOPTION OF AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING FURTHER article VIII(b) of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as the Convention), concerning the amendment procedure applicable to the Annex to the Convention, other than to the provisions of chapter I thereof,

HAVING CONSIDERED, at its eighty-sixth session, amendments to the Convention, proposed and circulated in accordance with article VIII(b)(i) thereof,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the Annex to the present resolution;

2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2010, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3. INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2011 upon their acceptance in accordance with paragraph 2 above;

4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the Annex to all Contracting Governments to the Convention;

5. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

[. . .]

CHAPTER V

SAFETY OF NAVIGATION

Regulation 19 – Carriage requirements for shipborne navigational systems and equipment

3 In paragraph 2.1, the existing subparagraph .4 is replaced by the following:

"*.4* nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage. An electronic chart display and information system (ECDIS) is also accepted as meeting the chart carriage requirements of this subparagraph. Ships to which paragraph 2.10 applies shall comply with the carriage requirements for ECDIS detailed therein;".

[. . .]

5 After the existing paragraph 2.9, the new paragraphs 2.10 and 2.11 are added as follows:

"2.10 Ships engaged on international voyages shall be fitted with an Electronic Chart Display and Information System (ECDIS) as follows:

.1 passenger ships of 500 gross tonnage and upwards constructed on or after 1 July 2012;

.2 tankers of 3,000 gross tonnage and upwards constructed on or after 1 July 2012;

.3 cargo ships, other than tankers, of 10,000 gross tonnage and upwards constructed on or after 1 July 2013;

.4 cargo ships, other than tankers, of 3,000 gross tonnage and upwards but less than 10,000 gross tonnage constructed on or after 1 July 2014;

.5 passenger ships of 500 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey* on or after 1 July 2014;

.6 tankers of 3,000 gross tonnage and upwards constructed before 1 July 2012, not later than the first survey* on or after 1 July 2015;

.7 cargo ships, other than tankers, of 50,000 gross tonnage and upwards constructed before 1 July 2013, not later than the first survey* on or after 1 July 2016;

.8 cargo ships, other than tankers, of 20,000 gross tonnage and upwards but less than 50,000 gross tonnage constructed before 1 July 2013, not later than the first survey* on or after 1 July 2017; and

.9 cargo ships, other than tankers, of 10,000 gross tonnage and upwards but less than 20,000 gross tonnage constructed before 1 July 2013, not later than the first survey* on or after 1 July 2018.

2.11 Administrations may exempt ships from the application of the requirements of paragraph 2.10 when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs .5 to .9 of paragraph 2.10."

---

* Refer to the Unified interpretation of the term "first survey" referred to in SOLAS regulations (MSC.1/Circ.1290).

[. . .]

Appendix 4

STCW Manila Amendments on ECDIS

Table A-II/1 Function: Navigation at the operational level

Column 1 **Competence**	Column 2 **Knowledge, understanding and proficiency**	Column 3 **Methods for demonstrating competence**	Column 4 **Criteria for evaluating competence**
Use of ECDIS to maintain the safety of navigation Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS These Limitations shall be reflected in the endorsements issued to the seafarer concerned	*Navigation using ECDIS* Knowledge of the capability and limitations of ECDIS operations, including: .1 a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats .2 the dangers of over-reliance .3 familiarity with the functions of ECDIS required by performance standards in force Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including: .1 use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings .2 safe monitoring and adjustment of information, including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced) .3 confirmation of vessel position by alternative means .4 efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements .5 adjustment of settings and values to suit the present conditions .6 situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors	Examination and assessment of evidence obtained from one or more of the following: .1 approved training ship experience .2 approved ECDIS simulator training	Monitors information on ECDIS in a manner that contributes to safe navigation Information obtained from ECDIS (including radar overlay and/or radar tracking functions, when fitted) is correctly interpreted and analysed, taking into account the limitations of the equipment, all connected sensors (including radar and AIS where interfaced), and prevailing circumstances and conditions Safety of navigation is maintained through adjustments made to the ship's course and speed through ECDIS-controlled track-keeping functions (when fitted) Communication is clear, concise and acknowledged at all times in a seamanlike manner

Table A-II/2 Function: Navigation at the management level

Column 1 **Competence**	Column 2 **Knowledge, understanding and proficiency**	Column 3 **Methods for demonstrating competence**	Column 4 **Criteria for evaluating competence**
Maintain the safety of navigation through the use of ECDIS and associated navigation systems to assist command decision making Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS. This limitation shall be reflected in the endorsement issued to the seafarer concerned	Management of operational procedures, system files and data, including: .1 manage procurement, licensing and updating of chart data and system software to conform to established procedures .2 system and information updating, including the ability to update ECDIS system version in accordance with vendor's product development .3 create and maintain system configuration and backup files .4 create and maintain log files in accordance with established procedures .5 create and maintain route plan files in accordance with established procedures .6 use ECDIS log-book and track history functions for inspection of system functions, alarm settings and user responses .7 use ECDIS playback functionality for passage review, route planning and review of system functions	Assessment of evidence obtained from one of the following: .1 approved in-service experience .2 approved training ship experience .3 approved ECDIS simulator training	Operational procedures for using ECDIS are established, applied, and monitored Actions taken to minimize risk to safety of navigation

Table A-II/3 Function: Navigation at the operational level

Column 1 **Competence**	Column 2 **Knowledge, understanding and proficiency**	Column 3 **Methods for demonstrating competence**	Column 4 **Criteria for evaluating competence**
Plan and conduct a coastal passage and determine position Note: Training and assessment in the use of ECDIS is not required for those who serve exclusively on ships not fitted with ECDIS. These limitations shall be reflected in the endorsement issued to the seafarer concerned	*Navigation* Thorough knowledge of and ability to use ECDIS	Examination and assessment of evidence obtained from one or more of the following: .1 approved training ship experience .2 approved ECDIS simulator training	

Appendix 5

Training scenario types and scenario success

Training Scenario types with various ship types and various geographic and environmental settings include:

- Some or all ownships operating in a large port area,
- Some or all ownships operating in open or coastal waters with converging traffic patterns
- Smaller groups transiting narrow passages in converging or opposing patterns,
- Group SAR operations that are visually demanding and ECDIS-dependent

Simple dynamics requiring effective use of ECDIS can include changes in passage requirements, environmental conditions, vessel types, task emphasis through procedural orders, etc.

Scenarios can vary between 15 minutes and more than 100 minutes depending on the number and depth of task elements involved

For example, six ships approach an anchorage at about the same time (an additional group can be run in parallel):

- All practice ship handling, visual navigation, communications, contact management
- All practice specific tasks on ECDIS

For example, two ships each with one assist tug (four ownships) entering a basin or channel is exponentially more complex than one ownship with an instructor controlling a tug and numerous target ships (additional groups of four can be run in parallel, depending on simulator capability):

- Two trainees conn ships, two trainees conn tugs
- All practice visual navigation, communications, maneuvering, lines, etc.

All of the foregoing scenario types apply ECDIS in a wide variety of navigational tasks

The following concerns are crucial to the success of such scenarios:

- Limit number ownships involved to preserve event realism and plausibility
- Embedding automatic assessment of selected variables
- Clearly established desired outcomes provided per ownship, especially through assessed value of actions taken & not taken
- Suiting workload to size of conning team (one or two)
- Responsibility of conn to keep detailed record of events and actions
- Provisions for backup means – alternate position and traffic plotting, etc.
- Opportunity to plan passage
- Opportunity to check instrument configuration
- Exercise debrief in classroom setting, to include playback with ownships re-assigned, systematic self-review of critical events per ownship

Appendix 6

Integrated navigation training example

The following description of integrated navigation training provides an example of how proficiencies in ECDIS may be developed with proven success.

In order to accommodate 150 trainees per year, 2 integrated navigation labs (INL) are configured, each with 16 isolated ownships (32 total). Additionally, a classroom (open lab) with 24 workstations, and another classroom with 18-workstations are also configured. All four labs have the same fully integrated simulation software package installed. Each lab is designed to run any combination of interacting ownships, depending on the exercise design.

The coaching on equipment and exercise review are conducted in the classrooms (open lab, Figure 1, below). Although each trainee sits at a dual-display desktop configuration, all of the same conning capabilities are present, including full visualization. In this environment, familiarization with tasks and functionalities are accomplished in a group manner that assures all trainees are developing the required skills.

Each ownship in the integrated navigation labs (INL) consists of the visual scene on a 42” display, conning including autopilot with track control and other navigation instruments, ECDIS and radar, VHF, and chart table (Figure 2, below). Sound is also integrated. Each ownship is in a 9ft x 5ft cubicle, where the conning officer stands. Space in each cubicle is sufficient for a team of two. The optimal training in the labs is in solo watchstanding with ECDIS, paper chart backup, and all other navigational aids.

The real learning for each trainee, however, takes place in the semi-isolated multiple ownships of the INL. The integration means there is always a visual scene for the underway context. The multiple ownships allow for a wide variety of scenarios, from single ownship exercises run simultaneously in parallel, to a single exercise with all ownships interacting as well as with target vessels from the instructor. In any case, specific learning objectives can be achieved by clustering task elements that support the overarching goal of safe navigation.

Figure 1 24-workstation integrated navigation classroom for coaching in ECDIS functionalities and navigation

Figure 2 16-workstation Integrated Navigation Lab (INL) for solo ECDIS navigation and assessment

___